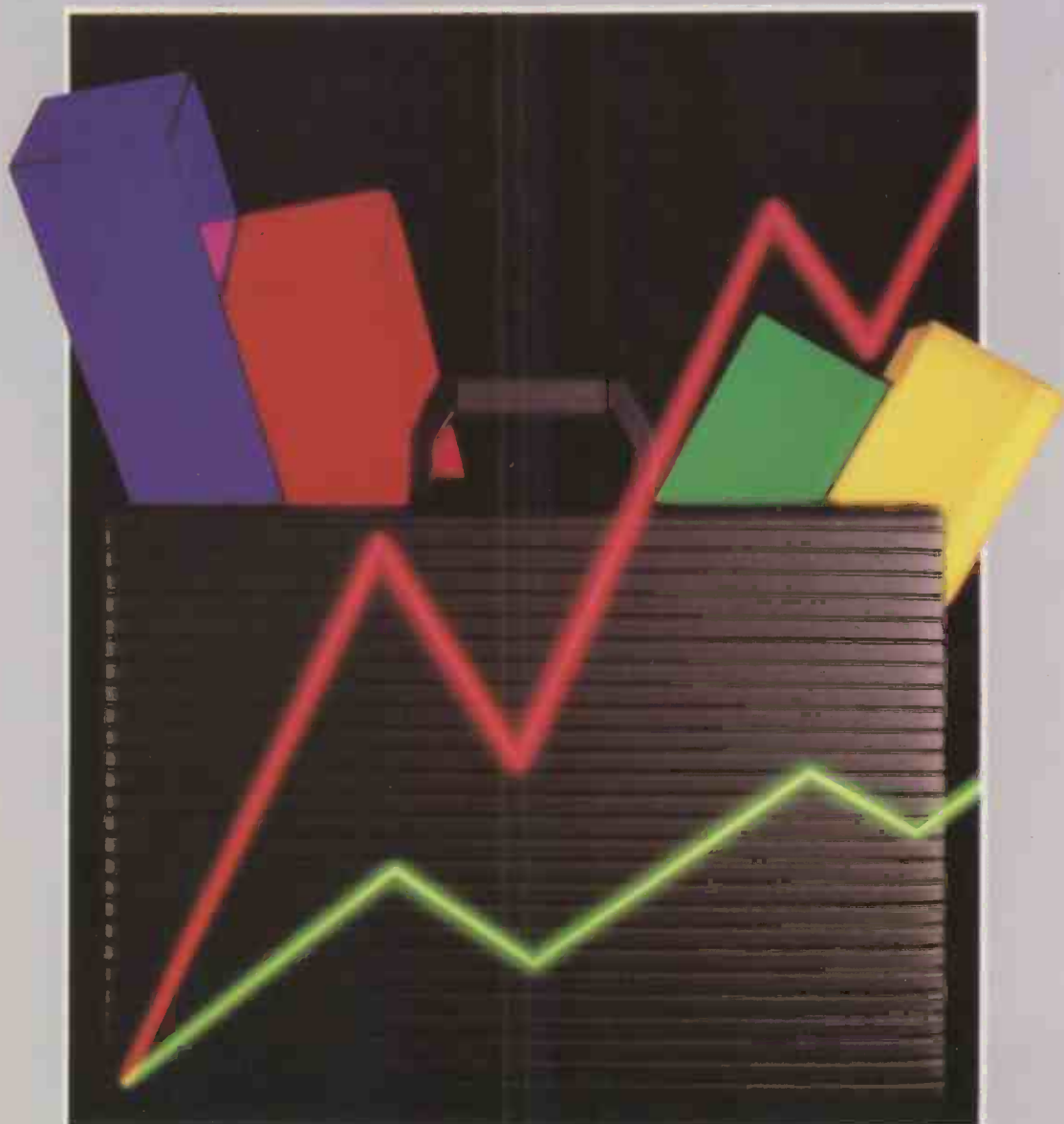


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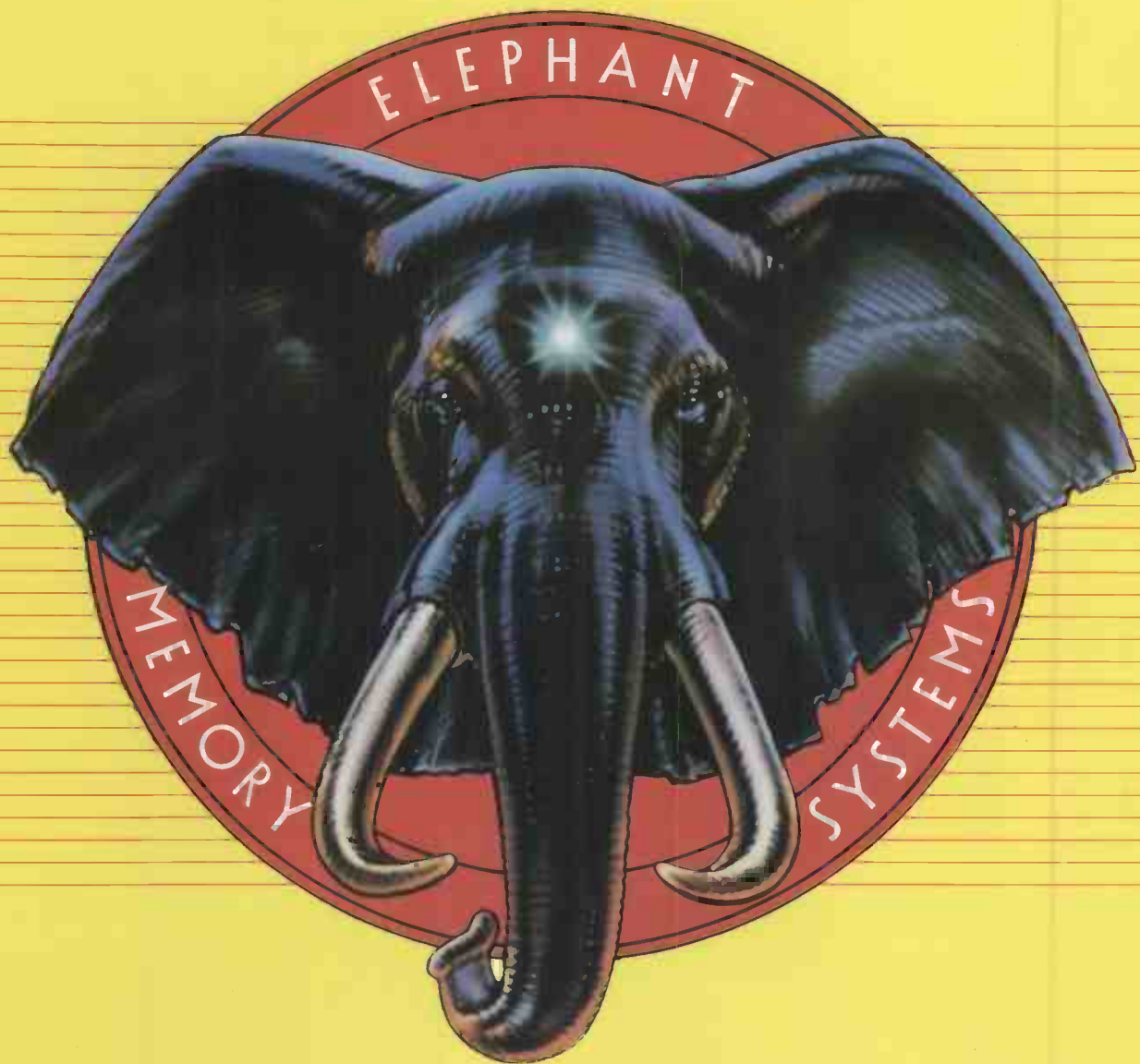
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ATARI
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BUSINESS GRAPHICS

This month's special feature looks at one of the hottest growth areas in the micro world, business graphics. *John Lewell* sets the scene with a list of major micro packages and an invaluable checklist of questions you should ask before taking the plunge into pictures. Then on page 85 *Glyn Moody* looks at three milestone products that have shaped and are shaping the face of graphics. Finally, on page 88 there is a round up of the latest hardware add-ons and software packages

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PRACTICAL COMPUTING

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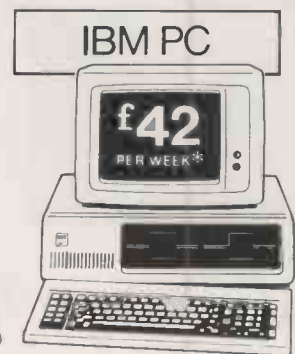
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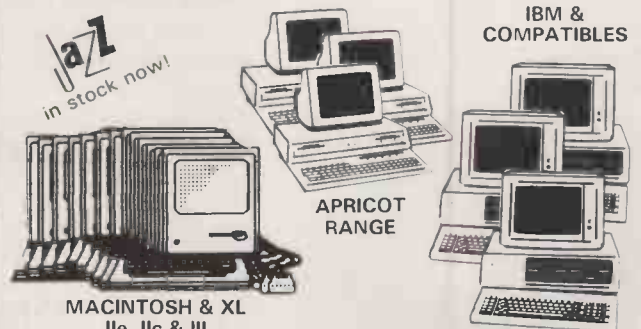
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The View From Here

It is — with apologies to Ray Charles — a long, long time from May to September. Before the autumn leaves start to fall, quite a few computer companies will have preceded them. Businesses tend not spend capital on computers during the holiday season, schools and colleges take long vacations, and the kids kick their Spectrums under the stairs before heading out for the park or beach.

This year most of the small micro companies were in trouble even before the summer. Commodore, caught in a spiral of decline, slid gracefully into the red. Acorn and Sinclair were reduced to rubble and had to be rescued for knock-down prices. Apple closed plants and laid off 1,200 workers. Data General, Wang and a dozen other companies have been hurt, and even IBM's profit growth has slowed.

Dozens of computer dealers, software houses, and a number of computer magazines have gone to the wall. Is it just the annual summer slump, or is there something fundamentally wrong?

As far as we can tell, the real computer industry is still enjoying sustained growth, though the bottom has dropped out of the toy market where Sinclair and Commodore made most of their sales. However, industry growth is probably only around 15 to 20 percent per annum. While this might be considered good in most industries, in computing it is a disaster, as many companies are aiming for at least twice that.

Perhaps there is something fundamentally wrong if successful operations cannot make worthwhile profits. Apple is an interesting example. Its sales have doubled in the last two years, from under \$1 billion in 1983 to a projected \$2 billion in 1985. This is good going, especially as Apple's products are hardly underpriced. Nevertheless, Apple's profits have slumped from \$76m in 1983 to a projected \$45m in 1985.

How can this be? Apple is a well-established computer company, which has high costs for staff, for research and development, and for support. Being only a computer company, it has to make money out of computers. Compare this with some of the rivals. Many have few staff since production is contracted out. Many do no research or development but simply follow industry standards, which means making IBM PC clones or buying in designs they need. Certainly they are not investing millions in pushing forward the frontiers of computing, as Apple did with the Lisa and Macintosh. These firms are less concerned with support, because they do not have a large user base and have no idea what support costs in the long term.

Finally, they may be aiming to make little or no profit. This may sound strange, but there are a number of large companies — some Japanese corporations, some office equipment companies — who missed out on the micro revolution and are now willing to

buy a market share by selling their machines at uneconomic prices.

The result is that 40 or 50 large companies are busy trying to take 10 percent of the market, while 200 to 300 smaller companies are trying, by ingenuity or innovation, to hold on to their own small slice. Market forces dictate that as supply goes up, prices come down. This is all very well for the consumer, except for a few minor points. For example, around 75 percent of the micro manufacturers will inevitably go bust, leaving hundreds of thousands of buyers with orphaned micros, a diminishing software base, few spare parts, no support and with a reduced prospect of the next generation of computers being any better than the last one.

Such is the position now, and there is no obvious solution. However, there does seem to be a distinction between those people who take a long-term view, and those who take the short-term one. Take the long-term view and considerations such as user support, the continuity of product lines and software are paramount. Take the shorter view and products have to be cheap and immediately appealing because, after all, they are not going to last more than a couple of years.

Interestingly enough, a similar situation obtains in software and among microcomputer magazines too. In our own case, *Practical Computing* is obviously taking the long-term view. At eight years of age we are already senior to the majority of companies in the industry, and we have been in the micro business twice as long as IBM. This summer we have invested a lot of time and money in product development — honing our coverage, improving the look of the magazine and extending our circulation. We hope you like the result, because it has to be paid for. The increased cover price of £1.25 from this issue will enable us to maintain the standard.

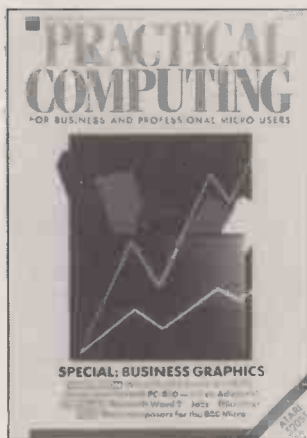
The integrity of the content, of course, cannot be bought. It comes free.

5 YEARS AGO...

After a delay of nearly seven months and much speculation that the project would be cancelled, the Government has finally decided to back Inmos with a further grant of £25 million, making a total investment of £50 million, to build a U.K.-based plant to produce advanced memory chips. The new plant will be built in south Wales, rather than the site preferred by Inmos in Bristol.

Inmos believes that the production plant will lead to the creation of more than 2,000 new jobs over the next three to four years. A second U.K. factory, also to be located in a depressed area, is planned. It should provide a further 1,650 jobs by 1985 and the NEB calculates that there will be a build-up of a similar number of jobs among Inmos suppliers in the U.K.

PC Volume 3 Issue 9



Business graphics: page 81.
Photo: Crispin Thomas.

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Faster Forth chip

RAY COLES' stimulating article on the Novix 4000 — Onward With Forth, June 85 — gave a good description of both the Forth language's history and the basic architecture of the chip, with its five parallel accessed buses.

True, the basic cycle time is 125 nanoseconds and more than one bus can be accessed in a cycle. The consequence of this, when coupled with the Forth Inc. optimising compiler supplied with the Novix, is that not one Forth operation but as many as five operations can be achieved in a single cycle.

Our estimates are that over an average application programs will achieve two Forth words per cycle. This gives a throughput of 16 million Forth words per second.

For those familiar with Forth, it goes without saying, but for those who don't know the language, all this power is available interactively. Incidentally, this power is not gained without some effort: it is a 124-pin chip.

Anyone interested in more details of this chip and the development system which uses a linked IBM PC should contact me.

C L STEPHENS,
Computer Solutions Ltd,
1 Gogmore Lane,
Chertsey,
Surrey KT16 9AP.

QL Benchmarks

IN THE Ask PC section in the June 1985 issue of *Practical Computing*, it is stated that the Benchmarks for the QL were very slow. The PCW Benchmarks which you used, presumably, are a very poor way of comparing machine performance. In fact you only have to compare the speed of the Basic interpreters, and they don't even do that very well. If Basic programs of any size are run on the QL, say of more than about 50 lines, and using meaningful variable names — not just single-letter variables — rather than simple loops with arithmetical operations using single-letter variables, in most cases the QL is considerably faster than the BBC, which is usually recognised as having one of the fastest Basics going.

The following program on my QL runs considerably faster than the same program on my TRS-80 Model II, with MBasic under CP/M, which is one of the faster machines around.

FEEDBACK

Our Feedback columns offer readers the opportunity of bringing their computing experience and problems to the attention of others, as well as to seek our advice or to make suggestions, which we are always happy to receive. Make sure you use Feedback — it is your chance to keep in touch.

Write to

Feedback, Practical Computing,

Quadrant House, The Quadrant,

Sutton, Surrey SM2 5AS

DON'T JUNK THE Z-80 YET!

AS A long-time reader and fan of *Practical Computing*, I am writing to express not only my endorsement of the comments in your June editorial, "The Chips Are Down" regarding PC-DOS/MS-DOS, but my hope that you will continue and even increase your coverage of eight-bit CP/M. Despite the dizzying rate of change in the microcomputer industry and the marketers' hype, computer users stick with what they have until they outgrow it — when there is a need for more storage or speed or whatever they feel is important to make their work more efficient.

My two-year-old micro — a Z-80 64K Kaypro 4 — is one of many orphaned computers left behind as manufacturers move on to the greener pastures of IBM PC/AT clonedom. It may be antique in computer terms, but it still does the work for which it was intended, and more. With any luck, the industry-standard OS will have transcended cheap and dirty rewrites of CP/M by the time I have truly outgrown it.

In the meantime, I am as interested in optimising the performance of my outdated system as I am in following new developments. The two often go hand-in-hand: using a faster CP/M machine inspired me to boost my own from 2.5MHz to 5MHz and using Prokey on an IBM PC inspired me to track down a program that would enable me to reconfigure my keyboard on the fly — Smartkey II+ from Software Research Technologies Inc.

Your continuing coverage of CP/M software and upgrades thereto (WordStar and the Perfect series, for example) is much appreciated, and I always find Mike Lewis's articles useful. Too bad, though, that the Lees' article on proportional spacing and WordStar did not compare Propstar to packages like Proportional Spacing from Chaucer Software, Magicprint from Computer Editype Systems, and Proportional Spacing on WordStar from Writing Consultants.

DEBORAH LOTH,
London.

```
100 PRINT "START"  
110 AARDVARK = 1.123  
130 FOR INDEX = 1 TO 1000  
150 AARDVARK = AARDVARK +  
1.123  
160 NEXT INDEX  
170 PRINT "STOP"
```

QL SuperBasic has been written in such a way that large programs run at about the same speed as small programs, which is definitely not the case with BBC Basic or MBasic. Since the majority of business programs are quite large, surely the speed of execution of such programs is a better criterion of a machine's performance than a handful of little programs that bear no relation whatsoever to the programs people actually use.

Disc operation is surprisingly also fast. Using the

CST/Computamate disc interface and a 40-track double-sided TEC drive, I can read 16K from disc into a string in 3.8 seconds. This is much faster than the IBM PC, I believe.

LEON HELLER,
Chairman,
Independent QL Users' Group,
Newport Pagnell,
Buckinghamshire.

THE EDITOR REPLIES: We agree that the standard Basic Benchmarks are rubbish, but comparative figures are available for a wide range of machines. To spare the blushes of another publication, they were actually written by *Kilobaud Microcomputing* in the U.S.A., back in the dark ages. We would

welcome some new routines that can be guaranteed to run on most micros. Any ideas?

Apple books

AN ERROR at our end has resulted in the wrong price for *Machine-Level Programming on the Apple II/IIe* being printed in the review in the June issue. The correct prices are as follows: book and disc package, ISBN 13 541913 1, £17.95 plus VAT; book only, ISBN 13 541897 6, £7.95; disc only, ISBN 13 541921 2, £10 plus VAT.

CAROLYN DOUGHERTY,
Prentice-Hall International,
Hemel Hempstead,
Hertfordshire.

Sharp keywords

I WOULD be glad to hear from any users of the Sharp PC-1500 about undocumented keywords, programmers' aids, etc. So far I have uncovered OPN, Call, Off, Poke#, Peek#, Poke and Peek — but I have only cracked the procedure for using the last two.

BILL JARVIS,
Ribchester,
Lancashire.

Is there a place for previews?

I WONDER if I am alone in finding Jack Schofield's previews and reviews over-enthusiastic and too trusting, not to mention somewhat short on fact. Indeed, should not the whole idea of previews be abandoned, since one of the basic rules of purchasing for business use is that one should forget about the product that is just around the corner? For the same reason, should there not be a less gushing style of comment?

As to facts, how the Atari 520ST keyboard could be described as any sort of imitation of the DEC VT-100, let alone a "passable" one, is beyond me. The VT-100 has a QWERTY and a numeric pad; the 520ST has QWERTY and two other pads, and there are many detail differences.

EDWARD BIGGS,
London SW16.

JACK SCHOFIELD REPLIES: We do previews to keep readers up to date on new products as they become available. We do not think any readers are foolish enough to base purchasing decisions on these, or even on

(continued on next page)

(continued from previous page)

full reviews, without examining the products themselves in depth.

Incidentally, our previews are normally based on two or three days' use, often in our own office. Your real complaint should go to magazines that publish "reviews" of products on less experience — and sometimes when, to our knowledge, the product does not work adequately or only in part.

As for my preview of the Atari 520ST, this was one of the least gushing published about this machine. Perhaps the subtitle "Another Quantum Leap" was too subtle, but there were other qualifications spelled out in the text.

My comparison of the 520ST keyboard with my memory of the DEC VT-100 was an error for which I apologise. However, the 520ST keyboard is "professional looking".

In general, *Practical Computing* reviews aim to be hard but fair. Bear in mind that there are 350 micros and several thousand software packages around, and we can only review or preview perhaps 35 of each per year. Under the circumstances we choose not to review bad or boring products unless they are important or significant on other grounds — for example, they are being hyped by large companies, or show new ways of doing things.

What do readers think?

Buying British

WITH reference to Mr Ray Daniels' lead letter, "Touché", in the July issue of *Practical Computing*, I wholeheartedly agree with his views, especially in view of the recent problems in the British computer industry. I refer to the recent news of lack of orders giving rise to financial problems in Acorn and Sinclair as well as redundancies in National Semiconductors.

I am sure that many readers will agree that if a British product compares favourably with imported technology, it could only benefit the industry to point this out.

As I am a distributor for the Ferranti range, I would like to bring to your readers' attention some upgrades for the Advance 86B which have not, to my knowledge, been published — dare I say a scoop for *Practical Computing*?

First, I would like to point out that the price quoted for the Advance 86B is slightly out of date and that since the end of May the 128K version has been available for just £800 and the 256K for £860. Even now the offer still stands, as well as a number of good-quality low cost extras:

- 10Mbyte and 20Mbyte IBM XT compatible hard discs.
- 10Mbyte tape streamer, which at just under £700 is about half the price of its competitors.
- Full network facilities.
- Emulation boards and software for compatibility with most mainframes.

With its no-frills low cost and extras the Advance 86B must now surely be at the forefront of the British business computer market.

C M ALLISON,
Longseer Limited,
Norwich.

THE EDITOR ADDS: See page 50 of this issue for our review of the latest micro from Ferranti.

LANs

I READ the Local Area Network article by Kathryn Custance in your July issue with interest. I would, however, like to point out that the information given about Nectar Systems is somewhat out of date.

The review of networking systems and suppliers lists us as only producing the Cluster One

network. In fact this was superseded two years ago by our Plan family of LANs: the Plan 2000, Plan 3000 and Plan 4000. These can link Apples and/or IBM PCs using Arcnet technology with up to 500Mbyte of central memory, and are compatible with IBM's own networking system.

ROB THORPE,
Nestar Systems,
Uxbridge,
Middlesex.

YOUR July issue included a report on our new cable-less communication network, Nectarring. This was obviously well received, as we have already sold several more systems to your readers, but I would like to put into context your comment on data integrity.

Since Nectarring uses the mains wiring to carry data, there is an obvious threat from mains noise. With this in mind, we designed the system to tolerate common sources of interference without significant error. Test reports from British Telecom and consultants Marshall Wood quote an error rate using Nectarring of one per five million characters.

The brief tests in your very large building showed no errors within your main office, and demonstrated that communication could be achieved with another room some floors away. The degradation of error rate over this distance was probably due to the two rooms being isolated by the layout of the building's multiple mains supplies.

Because buildings are as individual as their occupants, we and our dealers are always prepared to offer a free site test to establish correct operation, or to supply units on a sale or return basis. So far we have sold a lot of units, but none have been returned.

CHRIS MADDOX,
Nectar,
Gateshead.

Options

YOUR REVIEW of Options, which appeared in the June issue of *Practical Computing*, was fair and professional, and I am sure that users of Options, both current and future, will agree with you.

However, in your conclusion you stated that Options requires a colour system to run and that this presupposes a fairly hefty outlay. This is incorrect, as Options will run happily on a mono screen — though it does naturally look better in colour.

TOM MAXFIELD,
Sagesoft,
Gosforth.

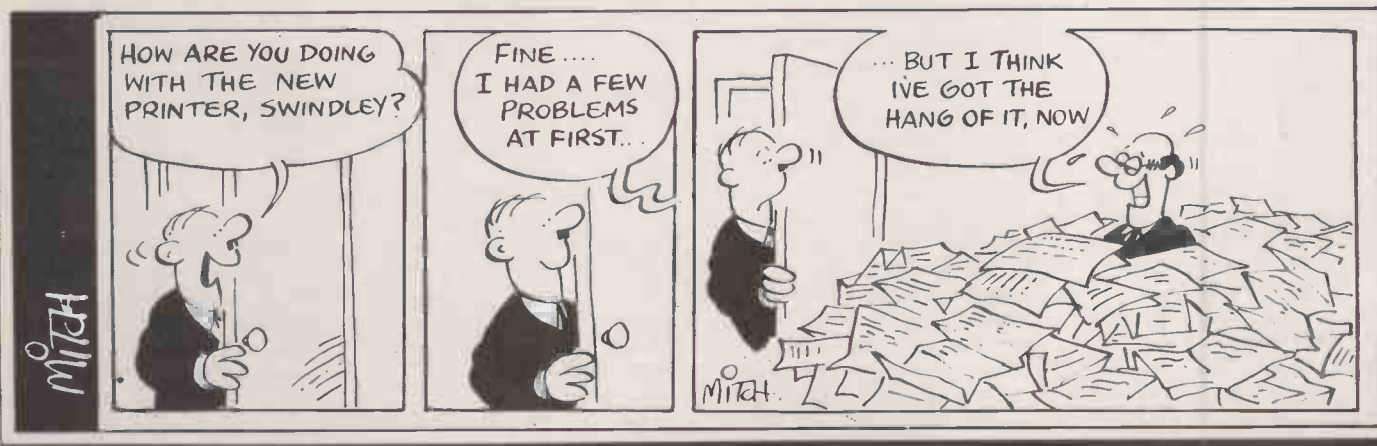
Typing tutors

IAN LITTERICK of Iansyst Ltd wrote in your June issue that "These are impossible to do conveniently on tape or on small memory machines."

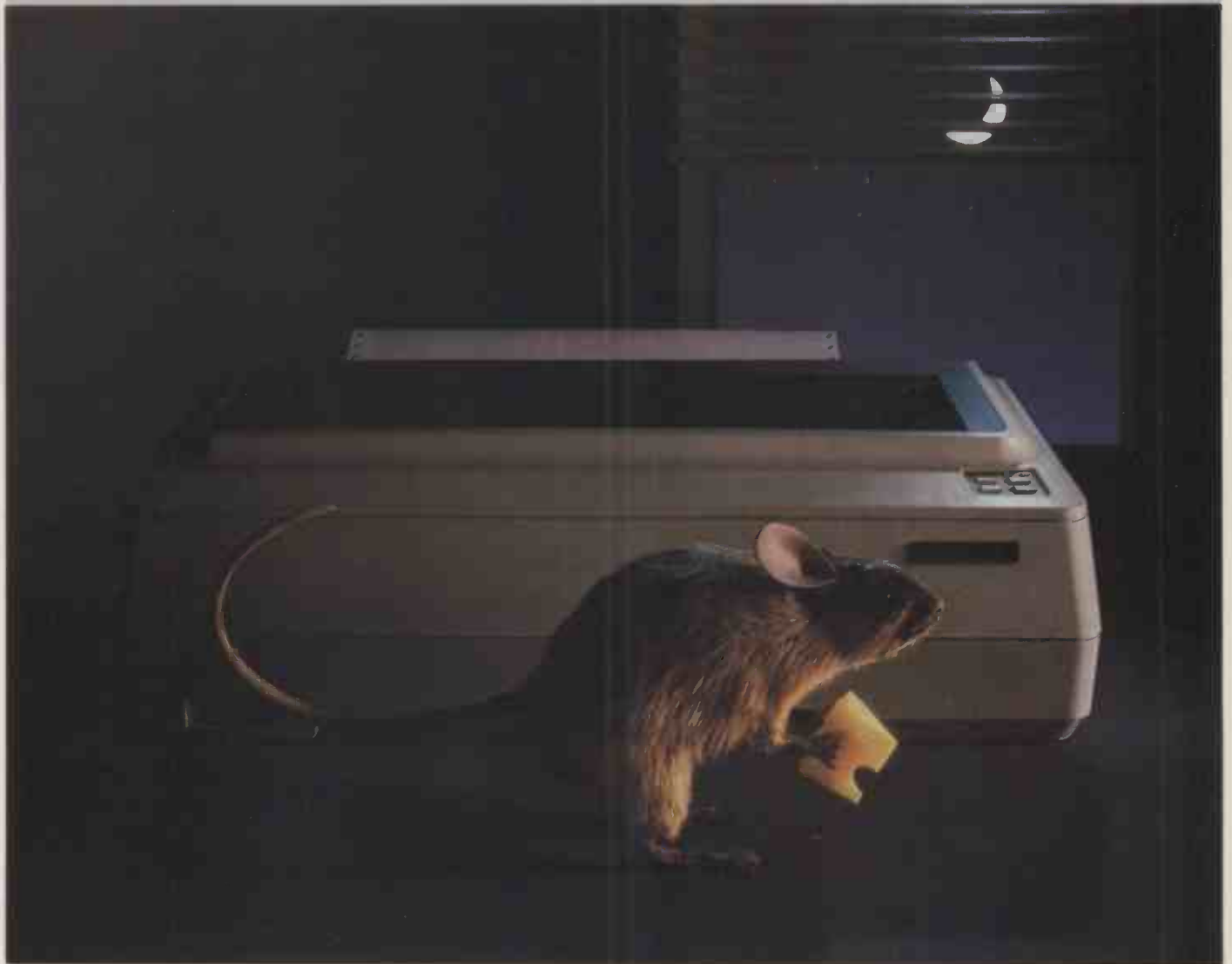
We have put the Touch 'N' Go typing tutor on to the 32K Dragon and this contains over 20K of practice material. Tiny Touch 'N' Go from Dorling Kindersley is also available on the Commodore 64, Spectrum Plus, Enterprise and Apple machines. We consider that 20K of practice is sufficient material for teaching up to the design goal of 40wpm. Even on the 32K Dragon, the pupil will have exercised at least 30,000 key depressions on completing the course. Perhaps Mr Litterick's method requires more practice than this.

Your February article missed Sinclair's launch of our Touch 'N' Go on the QL because of deadline dates, but now we have the full original CP/M MS-DOS Touch 'N' Go version on the QL with '61 lessons.

BOB HARCOURT,
Harcourt Systems,
Worthing,
West Sussex. PC



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Take a listen to the new MT85 and MT86 serial matrix printers. They're amazingly quiet. Which makes their performance definitely something to shout about.

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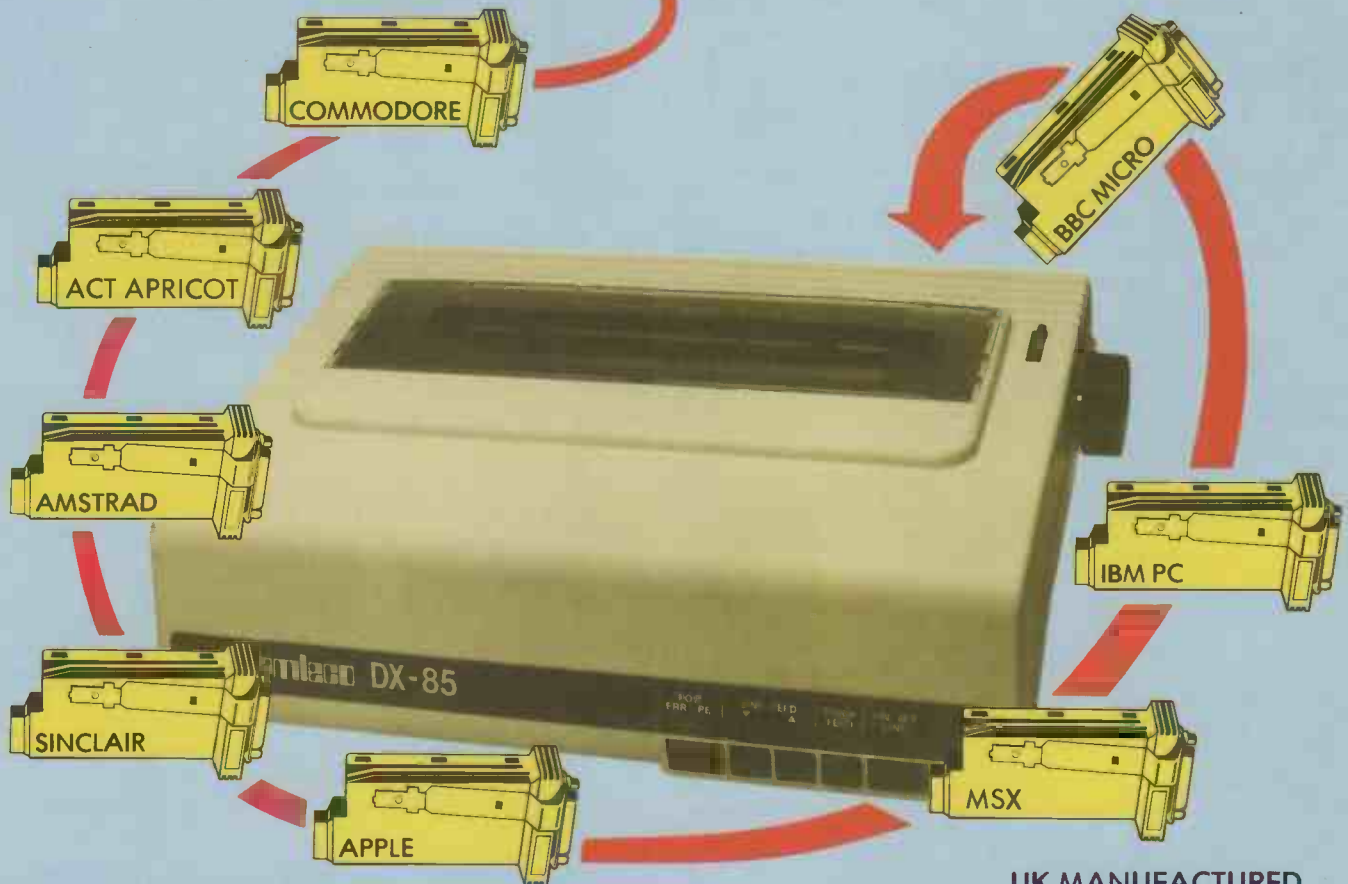


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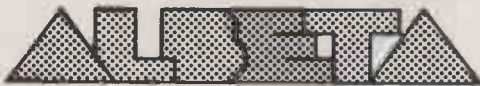


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VDUs 'NO RISK'

THE WORD from Parliament Street is that using a VDU is not a health risk for pregnant women, though the Civil Service unions remain unconvinced.

The Central Computer and Telecommunications Agency, HM Treasury, and the Civil Service Medical Advisory Service of the Cabinet Office have issued a

guidance note to government departments.

It states that "there is no evidence from any of the reports of clusters, or from any population survey, to support the proposition that use of VDUs during preg-

nancy is associated with adverse pregnancy outcome".

However, where operators are still worried, it is "no more than good management practice" to transfer them to other work if this is practicable.

The advantages of IDA

BRITISH TELECOM has launched a billion-pound-a-year program to install its integrated services digital network (ISDN). Customers link to this through a new service called integrated digital access (IDA).

IDA provides one access point — a single physical link — for speech, data, text, fast facsimile, pictures, graphics and slow-scan TV images. Also IDA offers an enhanced level of capability. For example, an A4 page can be facsimiled in six seconds, you can have photographic-quality colour

pictures on videotex, and slow-scan television can be relayed for security purposes.

British Telecom is mute regarding the fact that if IDA is a digital network then two ISDN users exchange data without using modems.

Each single-line IDA costs £890 to install, with an annual rental of £710 plus the usual call charges. Customers outside London, Manchester and Birmingham will have to pay an extra connection charge of £350 or £700.

TTNS

THE TIMES NETWORK for Schools has now been given its own Prime on the Telecom Gold network. The system is numbered 01: Gold has already run out of its allocated numbers from 75 to 85 in the international Dialcom network.

The PSS address or NUA is now A21230021001, and the NUI is NTIMESN208CZY.

Local education authorities can now enrol up to six primary schools in a pilot project for £25.

New items on the database include daily weather reports, Introduction to Industry '86 and software reviews.

Contact The Times Network Systems, PO Box 7, 200 Gray's Inn Road, London WC1X 8EZ. Tel: 01-837 1234 extn 7924.

Compec in the lead

COMPEC, will be 25 percent bigger this year, taking up the whole of Olympia from 12-15 November.

Among the 400 exhibitors to book so far are some newcomers including Sperry, Commodore and Toshiba.

Mini and mainframe computers are the major interest, but the growth of the Compec Software section shows the increasing involvement of micro companies.

Compec is sponsored by *Computer Weekly*, in association with *Practical Computing*.

Contact Reed Exhibitions, Surrey House, 1 Throwley Way, Sutton, Surrey SM1 4QQ. Telephone: 01-643 8040.



Olivetti has solved the problem of setting up demonstrations in awkward rooms with only one 13A plug. It now has a complete mobile showroom inside a 40ft. lorry. The Oli-lorry — sorry — is touring the country visiting main dealers, large companies, universities and colleges. Telephone: 01-785 6666.


BOOKS RECEIVED

Forward 100, by Ray Hammond. Published by Penguin Books, £5.95. ISBN 0 14 007819 3. New paperback version of a good introductory guide to Logo and child-centred learning.

Microcomputers and Children, by A J Obrist. Published by Hodder and Stoughton Software, £5.95. ISBN 0 340 37003 3. A useful introduction to the educational possibilities of small British micros for parents and children.

Educational Software Directory, by J Arthur and T Russell. Published by Macdonald & Evans Ltd, £12.50. ISBN 0 7121 0452 6. A comprehensive listing of educational software, with over 1,000 entries. Each program is described briefly. The book also has a useful bibliography, glossary and list of software suppliers.

The Microcomputer Users Handbook 1985, by Dennis Longley and Michael Shain. Published by Macmillan, £24.95. ISBN 0 333 36866 5. This somewhat expensive paperback annual claims to be "the complete and up-to-date guide to buying a business computer". The excellent introductory chapters cover hardware and software in a format suitable for beginners. However, the microcomputer survey, which is over 100 pages long, is out of date, making this not very useful as a buyers' guide.

The Guardian Guide to Microcomputing, by Jack Schofield. Published by Basil Blackwell, £5.95. ISBN 0 631 14304 1. For the last two years, *Practical Computing's* editor has written a weekly column on the Micro Futures page published every Thursday in the *Guardian*. This beginners' guide is basically a collection of the columns, and covers games to business computing. 

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Philips' 16-bit mystery machine

PHILIPS has announced a 80186-based machine which for some reason it is still shrouding in mystery. At the time of going to press it had no name beyond the Philips Personal Computer.

What is more certain is that it has 128K RAM, 64K ROM, one or two 3.5in. 720K floppies, and runs under DOS Plus or Concurrent DOS from Digital Research as well as MS-DOS. Monochrome or colour monitors can be used as well as ordinary TVs. There are Centronics and serial ports, and a ROM cartridge slot. It is also possible to attach 5.25in. floppies and hard discs in addition to the microfloppies.

The basic model costs around £1,000; a configuration with 512K RAM, hard disc and mouse interfaces plus Open Access will cost about £2,000. For more information try (0206) 575115.



Apricot family grows

ACT has announced the arrival of the Apricot Collection, formed out of the old portable — given a new keyboard and renamed as the FP — and the new F2 and F10. The two new machines are based on the F1 machine launched last year. The F2 has two 720K floppies and the F10 has one floppy and a 10Mbyte hard disc. Otherwise the specification is largely the same: 8086 processor, a generous 512K RAM, Gem front end, infrared mouse and keyboard. The latter differs from the rather unsatisfactory one found on the F1, and is closer to that on the Apricot PC. Monitors are extra.

As well as one serial and one



The huge IBM software base will be available to Mac users.

MAC CHARLIE

MAC CHARLIE allows you to hedge your bets by using a stylish Macintosh as a front end for running the vast array of IBM software. The Mac physically slots into a unit containing an 8088 processor and one or two 5.25in. floppies. A similar unit which encloses the Mac keyboard adds function keys and numeric keypad to match the IBM version.

The processor units are connected via a dedicated port to the Mac's printer port. Mac Charlie has its own printer port for connection to an Imagewriter.

The distributor, Technology Advancement Ltd, claims a high degree of IBM compatibility for the combined system. The unit comes with MS-DOS 3.10 which includes network options. This has the interesting effect of placing

network control under IBM software, not Mac software as would be the case with Appletalk which is designed to work with IBM PCs as well as Macs.

IBM applications are run within windows on the Mac screen. The software provided allows you to transfer data between Mac and IBM programs: you can move between WordStar and Macwrite.

The unit is designed and built by Dayna Communications of Salt Lake City, but it is marketed worldwide by Mitsui. In the country Technology Advancement U.K. Ltd is currently setting up a dealer network.

The single-floppy version comes with 256K RAM and costs £1,695; the double floppy has 640K and costs £2,650. Details on (0722) 338484.



parallel port, the new machines come bundled with Gem Write, Gem Paint, MS-DOS 2.11, GWBasic, asynchronous communications and an IBM emulator.

The F2 costs £1,495 and the F10

The revamped FP portable, 10Mbyte hard-disc F10, and dual-floppy F2.

£2,295; both prices exclude the cost of a monitor and VAT. Details on 021-501 2284.

Apple modem

AT LONG LAST Apple has launched a modem for both the Macintosh and the Apple II computers. It can operate at both 300 baud and 1,200/75 baud, and has autodial and auto-answer features.

Working in the 1,200/75 baud mode it can be used to access Prestel. Set to 300 baud it can work with Telecom Gold and other electronic mail services.

The modem costs £295 and is available from Apple dealers.

HARDWARE SHORTS

- Wyse PC prices have come down by 25 to 33 percent. The model 1100-1 which has 256K RAM and two floppies now costs £1,595, down from £2,175; the 10Mbyte version costs £2,495 instead of over £3,600. More on 01-267 7541.

- The Mannesmann Tally MT-85 180cps printers gives you IBM PC and Epson compatibility, as well as offering an Apple Imagewriter interface. The basic price is £369 with parallel or serial interface; the Imagewriter interface costs about £50. Details on (0734) 788711.

- The Hewlett-Packard Laserjet now costs £2,950, down from £3,595. More information on (0734) 784774.

- Midic is a Midi processor designed to work with micros via an RS-232 port. Once a computer has been used to set up the system, battery-backed RAM can be used to hold that information without a micro. Cost is from £300. More on (0865) 721731.

- The robot Hero Jr costs £749.95 including VAT instead of £1,099.95. Promised for later is an upgrade of Hero itself. Details on (0702) 552911.

- A switchable RS-232 cable is available from SMC Supplies. DIP switches at each end allow cables and equipment to be matched. More on 01-441 1282.

- Mac Turbotouch is an upmarket trackball for the Mac. Price is a mere £144. More information on (0706) 217744.

(More news on next page)

Telex for BOS

FIVE TECHNOLOGY has announced what it claims is the world's first Telex system for micros running under the multi-user BOS operating system, of which there are some 8,000 in the U.K. alone. The new system is approved by British Telecom.

For the rather steep price of £2,650 you get the necessary hardware additions, software and training. More information can be obtained from (05432) 57701.

Cleaned-up power

A NEAT power-supply cleaner for taking out spikes and interference has been devised that sits inside a standard three-way plug adaptor. Capacitive filters, inductive elements and a transient suppressor are used to remove mains-borne irregularities.

The unit costs £14. There is also a similar device based on a four-way socket and trailing lead costing £24. More information from Tony Firshman Services on 01-267 3887.



HP Portable Plus

HEWLETT-PACKARD has introduced an upgraded version of the HP-110 lap portable computer. Instead of the 16 lines by 80 characters of the earlier machine, the new model has 25 lines by 80 characters. The basic machine has 128K RAM expandable up to 896K, which can be partitioned to form a RAM disc. The ROM starts at 192K, and can grow up to 3Mbyte. MS-DOS is held in this form in the machine.

You can also run applications

software in ROM form. Already Lotus 1-2-3 and Microsoft Word are available for prices comparable with the disc-based versions. Two expansion drawers can be used to take extra ROM or RAM chips.

The machine weighs less than 10lb. and measures 13in. by 10in. by 3in. Battery-powered peripherals available for it include the Thinkjet and a 720K 3.5in. floppy. The cost is £2,395. Details on (0344) 424898.



Solar collector

A PHOTOVOLTAIC array that can be hooked up to micros for measurement and control purposes has been produced by Dighurst. The unit consists of a series of 10mm. by 50mm. collectors linked together to give a 7.5V, 200mA output.

One array is used to charge a small battery within the unit, while the second array supplied a signal to an in-built analogue to digital converter which sends input to the micro.

Versions are available for the IBM PC, Apple, Apricot, HP and BBC computers. For £195 you get the unit, cables, interface and software. Potential uses include solar measurement. Details on (0223) 208926.



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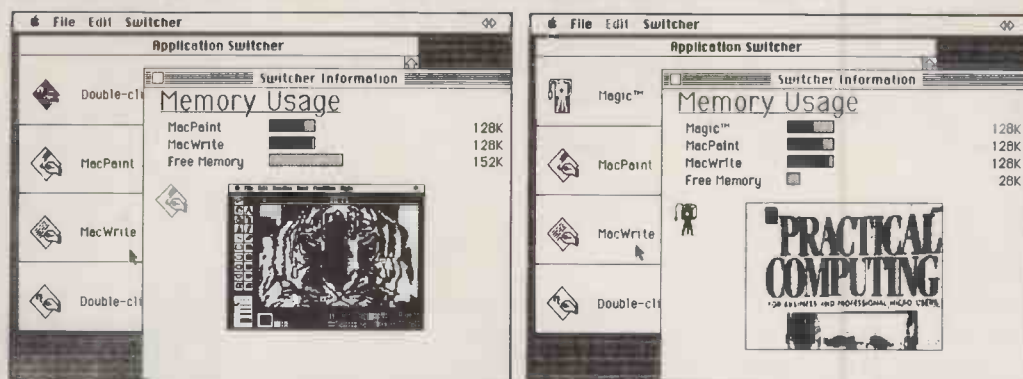
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INTEGRATE WITH SWITCHER

APPLE has announced a new product for the 512K Macintosh which will allow users to build their own integrated software from existing applications.

Switcher is a utility program which lets you load up to four programs at once and then switch quickly between them. It also helps to make data transfer between the different programs far easier.

Used with Macwrite and Macpaint, for instance, Switcher greatly speeds up the process of copying a picture into a word-processing document. Switcher does not work with extremely large programs such as Lotus's Jazz, which leave to little memory free. Nonetheless, Switcher does indicate the way things may go as



micros acquire more memory, and represents an alternative approach to pre-written integrated packages such as Jazz.

Apple is licensing Switcher to third-party developers for inclusion in their own products. Micro-

soft's forthcoming super-spreadsheet Excel, for example, will come with Switcher, which should allow users to transfer Excel data to Macwrite.

Details have not been finalised, but Switcher will probably also be

available very soon from Apple dealers as a stand-alone product, and the cost is expected to be low. Contact Apple Computer (U.K.) Ltd, Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ. Telephone: (0442) 60244.

Word processing with laser printers

DATAVIEW has made enhancements to its popular Wordcraft word-processing package in order to take full advantage of the possibilities now offered by laser printers. The latest version of Wordcraft can be used with either the Hewlett-Packard or Canon laser printer,

both of which cost around £3,000.

Wordcraft is available for most 16-bit machines, including the Sirius, Apricot and IBM PCs, and costs around £420 plus VAT. An interactive form-design program called Form Master can be used in conjunction with Wordcraft, and

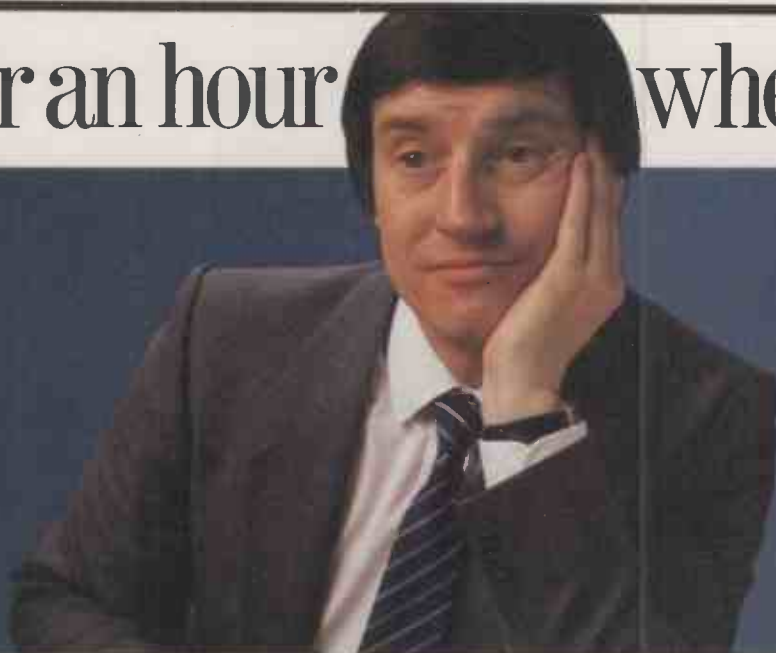
this will set you back about £100.

For more information contact Dataview Wordcraft Ltd, Radix House, East Street, Colchester, Essex CO1 2XB. Telephone: (0206) 869414.

Right: Dataview's Wordcraft will mix text and graphics.



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It uses all popular software with virtually no modification, it can be used vertically or horizontally, and if you ever change your computer you only need change one card.

*PC Megastore is a trademark of Ampex Corporation. *IBM-PC and IBM-XT are trademarks of IBM. †Apple II,

WordStar for Amstrad

MICROPRO has finally licensed a version of WordStar for the Amstrad 464 and 664. Priced at £149, Pocket WordStar is a slightly cut-down version of WordStar, but it does include the mail-merge function. Pocket WordStar will be distributed in the U.K. by Cumana. Contact Cumana Ltd, Pines Trading Estate, Broad Street, Guildford, Surrey GU3 3BH. Telephone: (0483) 503121.

Eliza 20 years on

ELIZA, the 20-year-old AI program made famous by Joseph Weizenbaum in his book *Computer Power and Human Reason*, is now available for IBM, Apple II and CP/M computers. Eliza simulates a psychotherapist, generating a series of apparently perceptive queries based on what you type in. The price is £45.

Details from Hampton Associates, The Old Farmhouse, Church Street, Meysey Hampton, Cirencester, Gloucester GL7 5JX. Telephone: (028585) 559.

Amstrad colour drawing program

OBVIOUSLY inspired by Macpaint, Icon Art Star for the Amstrad is a colour drawing program which offers solid and textured colour fills, airbrushing in a variety of patterns, and eight styles of text. Pictures can be dumped on either the DMP-1 or an Epson-compatible printer.

The program comes complete with a Marconi Tracker Ball which you use instead of a mouse. The whole lot costs £89.50 including VAT with the program supplied on cassette. Contact CTE Ltd, Ashton Lodge, Ashton Road, Dunstable, Bedfordshire LU6 1NP. Telephone: (0582) 61283.

Community computing

COMMUNITY COMPUTING '85, to be held in Sheffield on 13-14 September, is a national conference for non-commercial computer users. Sponsored by BP, it is aimed at voluntary organisations, resource centres and other such organisations that are interested in

providing computing as a community resource.

The conference fee will cost you £30. For further details contact Research Training Initiatives, 18-20 Dean Street, Newcastle upon Tyne NE1 1PG. Telephone: (0632) 616581.

Computer estimating

ESTIMASTER is aimed at businesses which need to produce written quotations for clients. The program constructs the quotation from a catalogue of items, and performs What-If? calculations before

printing out the final estimate.

Estimaster costs £295 plus VAT and runs on most 16-bit machines, including IBM, Apricot and Unix systems. Contact Abtex Software Ltd. Telephone: (0274) 734838.

SOFTWARE SHORTS

Hisoft C for both Amstrad machines is a full version of the compiled language with additional support for Amstrad sound and graphics. It costs £34.95 including VAT on tape and £39.95 on disc. Telephone: (0582) 696421.

C Power is a C compiler for the Commodore 64. Supplied on disc, price £119.95 including VAT, it too is a full version of the popular systems programming language, and it comes with a 531-page manual. Contact Dynamite Software, BCM 8713, 27a Old Gloucester Street, London WC1N 3XX.

Blast is a Basic compiler for the Sinclair Spectrum. It is claimed to compile any Basic program, without alteration, to Z-80 machine code. Blast is supplied on cassette, but can be backed up to a Microdrive, and costs £24.95 including VAT. Contact Oxford Computer Systems (Software) Ltd, Hensington Road, Woodstock, Oxford OX7 1JR. Tel: (0993) 812700.

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Take the BP 5420 for example.

Fast, quiet and designed for heavy duty use, it combines high speed quality print at 420 cps (draft) and 104 cps (NLQ) with an 18K buffer. For ease of operation all user controls, plus the selector switch

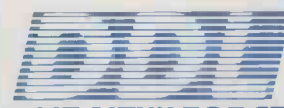
for the 8 built-in fonts, are located on the front panel of the printer. Parallel and serial interfaces are standard.

Then, exclusively for the IBM PC and compatibles are the BP 5420I and BP 5200I.

The BP 5420I combines most of the features of the BP 5420 printer with all IBM characters, symbols and graphics as standard. The BP 5200I operates at 206 cps (draft) and 103 cps (NLQ) and represents one of the best value printers of its kind on the market.

Finally, the compact SP NLQ printer series meets the needs of smaller businesses.

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Jetprinter

IBM has launched a £699 colour ink-jet printer which prints near letter quality text and graphics in up to seven colours. The ink comes in two cartridges: one contains black, and the other three base colours cyan, magenta and yellow.

Printing speeds are 30cps in NLQ mode, and 50cps in draft mode. Another attraction of the Jetprinter is that it is very quiet at 46 decibels.

Contact your local IBM PC dealer for information.

Super Utility

MOLIMERX is now producing and distributing Powersoft's Super Utility disc for IBM PCs and compatibles. It allows you to map both floppy and hard discs, restore deleted files, change directories and copy sector by sector. And it costs only £46 including VAT.

Data recovery is such a vital point for all serious users that concepts like zapping, cracking and hacking need not even be mentioned.

Contact Molimerx Ltd, 1 Buckhurst Road, Town Hall Square, Bexhill on Sea, East Sussex TN40 1QF. Telephone: (0424) 220391 or 223636.

Memory/Shift

MEMORY/SHIFT is a £125 program that enables up to nine programs to be loaded into an IBM PC at once. After that you can switch between them. The advantage it has over IBM's Topview is that it only takes up 48K, instead of 154K of RAM. You still need quite a lot of memory to run even a couple of packages at the same time, but for people with 512K or 640K it may be a convenient option.

Memory/Shift was first launched in the U.S. about two years ago. It is now being distributed in the U.K. by Caxton Software, 10-14 Bedford Street, London WC2E 9HE. Telephone: 01-379 6502.

Personal Mapper and Pick

SPERRY'S easy-to-use application development system, Mapper, has been ported down from the mini and mainframe world to run on the Sperry PC or other IBM compatibles. The Mapper database is supplied on nine floppy discs along with an expansion card that carries a Motorola 68010 chip and 512K of RAM. You also need a

ANOTHER DESK-TOP MINI

IBM has continued the process of sticking minis and mainframes into PC-sized boxes with the launch of the System 36 PC. This is a scaled-down version of the System/36 minicomputer inside what looks like a PC/AT system box. You then need another IBM PC with which to run it, and at the price may feel you have to add two extra PCs as terminals.

A 256K version of the 36 PC with 40Mbyte hard disc costs £5,440. A Model 2 version with two 40Mbyte drives costs £7,225. Bear in mind that the operating system itself takes up 25Mbyte, so you will not want a small version.

Software for the 36 PC includes the System Support Program at

£1,024, Cobol at £1,000, Fortran IV at £1,209, and the report generator RPG II at £321.

It is claimed that by putting a controller card in the PC console, up to 64 terminals can be connected, but the performance degradation must be phenomenal.

In sum, the System 36 PC is the sort of product that gives 6800-based Unix boxes a good name. But presumably it must make some sort of sense to at least a few corporate data-processing departments, otherwise IBM would not have launched it.

Other new IBM products include standard and graphics versions of the 3270 PC terminal based on the PC/AT.



Smart trackball

THE MICROLYNX trackball comes with IBM-compatible firmware which enables you to call up a short menu before booting your program, or from inside it. You can then program the ball and button movements to provide the ideal add-on for your particular spreadsheet, word processor or graphics application. It uses the

PC's serial port and thus does not take up an expansion slot. It costs £330.

The trackball's distributor, Comtec, also makes a 6in. by 6in. digitising tablet with a resolution of 0.001in. Contact Comtec Data Systems, Weston House, Cranford Lane, Harlington, Middlesex UB3 5HD. Telephone: 01-897 3225/6.

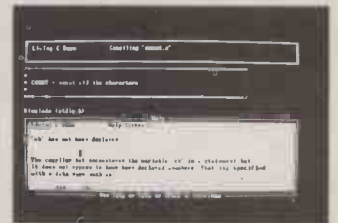
IBM SHORTS

● Compaq has cut the prices of its micros by up to 16 percent. Models 1 and 2 of the new 286-based models cost £3,695 and £5,195 respectively. Telephone 01-940 8860

● STC has cut the price of its ITT Xtra PC and PC/XT-alike micros to £1,995 and £2,995 respectively. The 286-based Xtra XP with 10Mbyte hard disc, monitor and DOS costs £3,595. Tel: 01-300 7788.

● Menu Maker is now available from Micro Database Systems. It costs £250. Telephone: (0753) 840197. A similar but simpler package is PC Menu, which costs £50. Telephone: (0734) 508131.

● Expert 4 is an expert-system shell which allows fuzzy logic and is very attractively priced at £66. Telephone: (0223) 315961. Ex-Tran VI is a Michie-developed expert-system builder which runs on micros, minis and mainframes. Rules are generated as Fortran 77 code. Prices are £1,995 for IBM PC versions, or £18,000 for mini/mainframe ones. Telephone: 041-552 1353.



● Living C Personal is a PC version of a complete C programming environment. It provides a full-screen editor for program design, development and debugging. The price is £99. Telephone: 01-948 5166.

● Handy-3 is a background operating program which provides more than the usual print spooling while foreground operations are under way. Facilities include communications, address/phone directory, auto-diary, notebook and DOS commands handler. It takes up 37K of RAM and costs £119. Telephone: 01-542 7010.

● Inner Product's Allways package provides Teletype and viewdata communications for Prestel, Telecom Gold, etc. It costs £300. Tel: 01-673 3354. 

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PC USER SHOW

A REASONABLE person might think there were already enough IBM PC compatible micros in the world. The PC User Show, held at Olympia on 2 to 4 July, revealed that manufacturers know different.

The most interesting of the new micros were 80286-based machines previously shown in the U.S. but making their first U.K. appearance. Examples include the NCR 8, ITT Xtra XP and Zenith Z-200, as described in our July issue, page 21.

Top of the Zenith range is the Z-200, an AT-alike with 512K of RAM, a 1.2Mbyte floppy and colour graphics as standard. Prices start at £3,295, including a 12in. screen and software. Models with 20Mbyte hard discs start at £4,450. Delivery is expected around September.

The Z-171 is a more unusual machine. It is an improved version of the familiar Morrow Pivot/Datavue 25/Osborne Encore portable design. It has the same shoulder-bag shape with hinged keyboard, and two built-in 5.25in. floppy-disc drives. The major difference is the 80-by-25 backlit LCD screen. This comes closest so far to offering something of the legibility of a CRT screen, while keeping the advantages of low weight and low power consumption of an LCD. It runs on battery or mains power, weighs 14.3lb. and costs £2,295.

Will it be available from other companies, like the Pivot? Zenith says the Z-171 is made by Zenith and sold to Morrow.

Zenith showed three other new micros: the Z-138, Z-148 and Z-158. All are 8088-based IBM PC compatibles with dual-speed CPUs, clocking at 4.77MHz and 8MHz. The Z-138 is a transportable with 128K of RAM and a 7in. screen. The Z-148 is a desktop model which costs £1,320 with 128K of RAM and one 5.25in. drive, or £1,480 with 256K and two floppies. These models do not have internal expansion slots.

The Z-158 has a similar specifi-

cation but has four free slots in the floppy-based systems, and three with a hard disc installed. Prices run from £1,695 with 128K RAM and one floppy, to £3,160 with a 10Mbyte hard disc.

Zenith is a major force in the U.S., selling large numbers of compatibles. To become a force in the U.K. it will need to offer better prices than those announced for the 8088-based models. Telephone: (0494) 448781.

ITT's Xtra XP has an 80286, but is PC/XT compatible, rather than aiming at the AT. In fact, it is claimed to be the fastest PC compatible yet, though the CPU is only run at 6MHz. Except for the built-in hard disc, the XP looks identical, externally, to the current ITT Xtra. Xtra prices now start at £1,995 for dual-floppy versions, while the XP-10 with 10Mbyte hard disc costs £3,595. Telephone: 01-440 4141.

NCR's PC6 is a PC compatible which, like the Zenith and many other models, uses the 8088-2 chip to provide dual speeds of 4.77MHz and 8MHz. The PC8 is an AT compatible with an 80286 chip running at 8MHz.

Both machines have a full specification and complete range of models. They also feature enhanced keyboards, optional built-in tape backup, and optional enhanced 640-by-400-pixel graphics. Telephone: 01-723 7070.

A further two compatibles were shown by Paperlogic. The Turbo PC is an 8088-2 based dual-speed PC compatible with 256K of RAM, two floppy-disc drives, monochrome/graphics board, enhanced 99-key keyboard and MS-DOS for £1,495.

Paperlogic's AT-alike has an 80286 chip that can be switched up from the IBM's 6MHz to 8MHz. The price with 512K of RAM, one 1.2Mbyte floppy, a 20Mbyte hard disc, colour display, DOS 3 and Basic is £4,695. Telephone: 01-935 0480.

Future Management, which used to be Osborne U.K., is also selling price-competitive micros of

Far Eastern origin. It has signed a private label deal with Oemtek of Taiwan's Hsinchu Science Park — see our June 1984 issue, page 88.

FM's Spirit PC-alike offers 512K of RAM, two floppies, a 14in. display and the Integrated 7 multi-function software suite for £1,495. Rather better value is the Spirit XT, which offers a 10Mbyte hard disc instead of one of the floppies, adds an RS-232C card and costs only £1,995.

The company also announced some special offers — valid to August 31 — on its existing micros. For example, there is £400 off the Osborne Encore with 256K of RAM and two discs. This has only an 80-by-16-line LCD screen, but it costs £1,000 less than the 80-by-25-line backlit LCD version launched by Zenith. The original Osborne 1, with its 5in. screen, is down another £100 to £495, which is less than the normal price of the bundled Micropro software. Telephone: (0908) 615274.

Leading Edge is well known in the U.S., for both software and hardware. It now has a PC compatible made by Daewoo in Korea, and is looking for U.K. importers and distributors.

The Leading Edge Model D is compact and looks smart, but the specification is boring and the price may be too high. The D has an 8088 running at 4.77MHz, 256K of RAM, two floppies and a 12in. screen for \$1,495 or £1,495. Telephone: (U.S. area code 617) 828-8150.

Apart from the new hardware, the Olivetti stand was one of the most interesting at the show with Gem, its own network and enhanced colour graphics on display. DR Gem looks great on the M-24, because it uses the enhanced 640-by-400-pixel resolution, instead of the IBM's standard 640 by 200. Also it runs about twice as fast. Olivetti's new enhanced graphics controller — to be launched later this year — provides 16 colours with the same resolution. Telephone: 01-785 6666.



Zenith Z-200.

SHOW SHORTS

- Nine Tiles showed the Multilink local area network, which allows a wide range of micros to be linked together very cheaply. Examples include IBM, ACT, Apple, BBC and Amstrads. For further information ring (0223) 862125.

- Paperlogic's Laserword is a special word processor to support the new laser-printing technology — initially Hewlett-Packard's Laserjet and the Facit Opus 1. Telephone: 01-935 0480.

- SPI's Open Access integrated suite has been unbundled. Access 4 provides the spreadsheet, graphics and list management, after the style of Lotus 1-2-3. Telephone: (07357) 4081.

- Keytronic now offers an IBM PC compatible keyboard with a built-in touch pad. Telephone: (0420) 88674.

- DDL has the Rocal-Milgo integral Personal Modem for the IBM PC, claimed to be the first such to receive British Telecom approval. Speakeasy software includes the facility for local editing of Prestel frames. Telephone: (0990) 28921.

- ESM's Financial Management System is a cheap way of keeping up to date with stock-market prices and currency fluctuations. A special peripheral grabs the data broadcast free via teletext and feeds it into the package, which runs on an IBM PC or other micro. Telephone: (0767) 261161.

- C-DOC is a utility which helps programmers document code written in C. The company, Figure Flow, also offers a C Browser and a Program Tuning Kit. For further information ring (0473) 822917.

PC



NCR PC6.



Paperlogic's Turbo PC.



Spirit PC/XT.

Q Lured by the low price and the large amount of free software, I bought a Sanyo 555. But I had so many difficulties with it that I have now scrapped it and bought an Apricot F1 instead. I had used Datastar on the Sanyo to create several large database files. I got Grey Matter to copy Datastar and the data files from a Sanyo 5.25in. disc to an Apricot 3in. disc, to use on my new machine. Despite a lot of help from Grey Matter, the program will not work on the F1. I don't understand why, but am told it is something to do with the way Datastar has been installed. At no time was I asked to sign any undertaking regarding the use of the software package, nor was it made clear to me that this software would only run on that machine. After all, the machine does run under MS-DOS. I am surprised and cross that Sanyo can get away with this, as there is no mention in their information that this is not standard software.

Can you explain why I have problems? Is there any way out other than spending a lot of money on a standard version of Datastar for my Apricot?

JOHN HANNAVY

A We are most surprised to hear that you were not asked to sign a licensing agreement that the software that you got with the Sanyo was licensed for use on one machine only. If you purchase the software separately this is certainly the case, and copying it to use on another machine would probably be illegal. Your cautionary tale highlights the message that there is no guarantee that software from one machine will run on another, despite the emergence of PC-DOS and MS-DOS as the standard operating system for computers with the 8088, 8086, 80186 and 80286 CPU chips.

The software given away with the Sanyo normally costs almost as much as you paid for the computer and software together. We guess that Sanyo got a good financial deal from Micropro on condition that it installed the software for its own machine and distributed the installed version, which will not work on any other machine. Since Sanyo does not provide the installation program, you cannot reinstall it and so cannot make it work on another make of computer. It is clever marketing, but a nuisance to you.

Grey Matter has been in the business of copying discs of different formats for a long time, and we are sure that your

CAD OF PCBs

Q I am interested in computer-aided design on printed-circuit boards, and am having a great deal of difficulty in obtaining information on what is a comparatively new technology. I would greatly appreciate it if you could offer advice, or suggest a book or magazine that deals with this subject.

T MORELAND

A Electronic CAD is a blanket term, and is loosely used to cover both the design of printed-circuit boards and also VLSI design of chips. There are a large number of products that claim to design PCBs. Some are simply a substitute for a drawing board, but the better ones perform auto-routing, and work out where to take the wires or tracks. This feature is important when you alter the design of a board, since it will work out the new positions for the tracks after the alteration, whereas without it you would need to start the design again from scratch. Some of my electrical engineering friends claim that they can design boards better than the computer, but this largely depends on having software that is in sympathy with your ideas on how it should be done.

The cheapest package we have heard of is Cirkwik, which uses a light-pen on a BBC Micro and costs £19.95. We know of someone who uses the Macpaint drawing facilities on a Macintosh for drawing PCBs. Most of the packages are very expensive. There are a lot of packages — which can be rated as fair to middling — for the IBM PC class of machine. Among those that have been mentioned to me are P-Cad, Smartwork, Cad-Brain, Daisy VO3. We cannot comment on their merits or limitations. For really top packages a mainframe computer is required, and we are told that Racal's Cadet is one of the best.

For further information you could try The Institution of Electrical Engineers, Savoy Place, London WC2R 0BL, which produces a CAE Data Service Newsletter, and also a PCB list called Cadmat which gives information on products and suppliers. Universities and academic institutions run the SERC Electronics CAD User Group, and you may get information from The Science and Engineering Research Council CAD Users Group, Rutherford Appleton Laboratories, Chilton, Didcot, Oxfordshire OX11 0QX. Pages 34 to 36 of the February 1985 issue of *Cadcam International* list a number of graphics systems, together with suppliers and prices. A number of these may be generally useful, and some are specifically for PCB design.

?.!.?.!.?.!.?.!.?.!.?.!.?.!.?.!.?.!.?.!.?.!.?.!.?.!.?.!.?.!.

program was correctly copied. You say it starts to run but gets stuck. Almost certainly there are differences in the input/output driver installed in your Sanyo version and what is required for the Apricot. Put simply, the keyboard is not talking to the program. You have no chance of rectifying this without the DInstall program.

If you have a master disc with Datastar on it, you might find a computer dealer who will update your old master copy for a nominal charge by exchanging it for a new version on Apricot discs, with the old serial number on the new copy. Alternatively you need the help of a computer user who has an Apricot, who will try to run DInstall to install your copy of Datastar for you. You do not have an absolute guarantee that DInstall will work. For example, the Install program for the WordStar checks that the WordStar is the same version as the Install program, and will not work if they are different. Failing this, buy another copy.

Q I am looking for a neat way to label my floppy discs. If I write on the dust covers, discs get in the wrong dust cover. I could use sticky labels, but they may come off or become out of date. I run under CP/M, and would really like to put some sort of labelling on the disc itself, so that it could not get lost or muddled, and would show every time I did a Dir to list my files.

KEVIN ANDREWS

A Some people keep a printout of the directory inside the sleeve. While this shows the contents of the disc, the list will get out of date and you can easily get the wrong piece of paper stored with a disc. You need an easy way of checking that the list of files on the paper refers to that particular disc.

The solution we have adopted is as follows. Immediately after formatting a disc for the first time, and before any files have

been written on the disc, we write a file of zero length on the disc and use this file name to label the disc. This is done under CP/M with the command
SAVE 0 filename

It is important that this is the first file written on the disc, then the Dir command will always list this file first. It must be remembered that the command
STAT *.*

lists the files and arranges them in alphabetical order, so generally the dummy file name used to label the disc will not appear at the beginning of the list of files.

To make this file list first with Stat, you should choose a file name that begins with a -, for example -Letters, -Letters.2 or -Basprog.5. Since the - symbol has a smaller ASCII value than any of the letters used for a file name, it follows that when Stat sorts the files into order it will put the dummy file at the top. Remember that the - sign counts as one character, and that the first part of the file name may not exceed eight characters in all.

There remains the problem of how to label all those discs that you already have, which are partly filled with files. If you simply save the dummy file of zero length, then the Dir command will not list it first. You must do a Dir command to see which is the first file listed. Then copy this file into a file called Temp, with the command
PIP TEMP=name-of-first-file

Then delete the first file, thus making a space in the directory
ERA name-of-first-file
Then create the dummy file of zero length with the command
SAVE 0 filename

and finally rename the temporary file with its original name
REN name-of-first-file=TEMP
The use of a dummy file in this way permanently labels the disc, and you can always identify the disc by doing a Dir or a Stat command. Since the file is of zero length, it does not reduce the amount of space available for storing files on the disc. It does, however, occupy one space in the directory. Many versions of CP/M only have space for 64 file entries in the directory, so because of the dummy file, the maximum number of files which may be stored is reduced to 63.

In practice, the maximum number of files is likely to be less than this. Small files of less than 16K have one entry in the directory, but large files have a directory entry for each 16K of the total file, so a 20K file has two directory entries and a 33K file has three.



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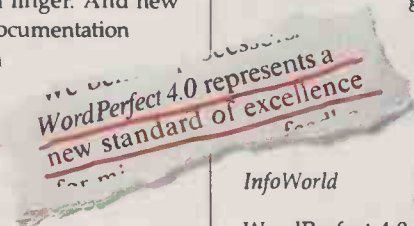
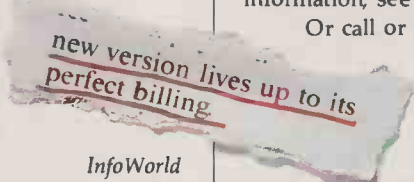
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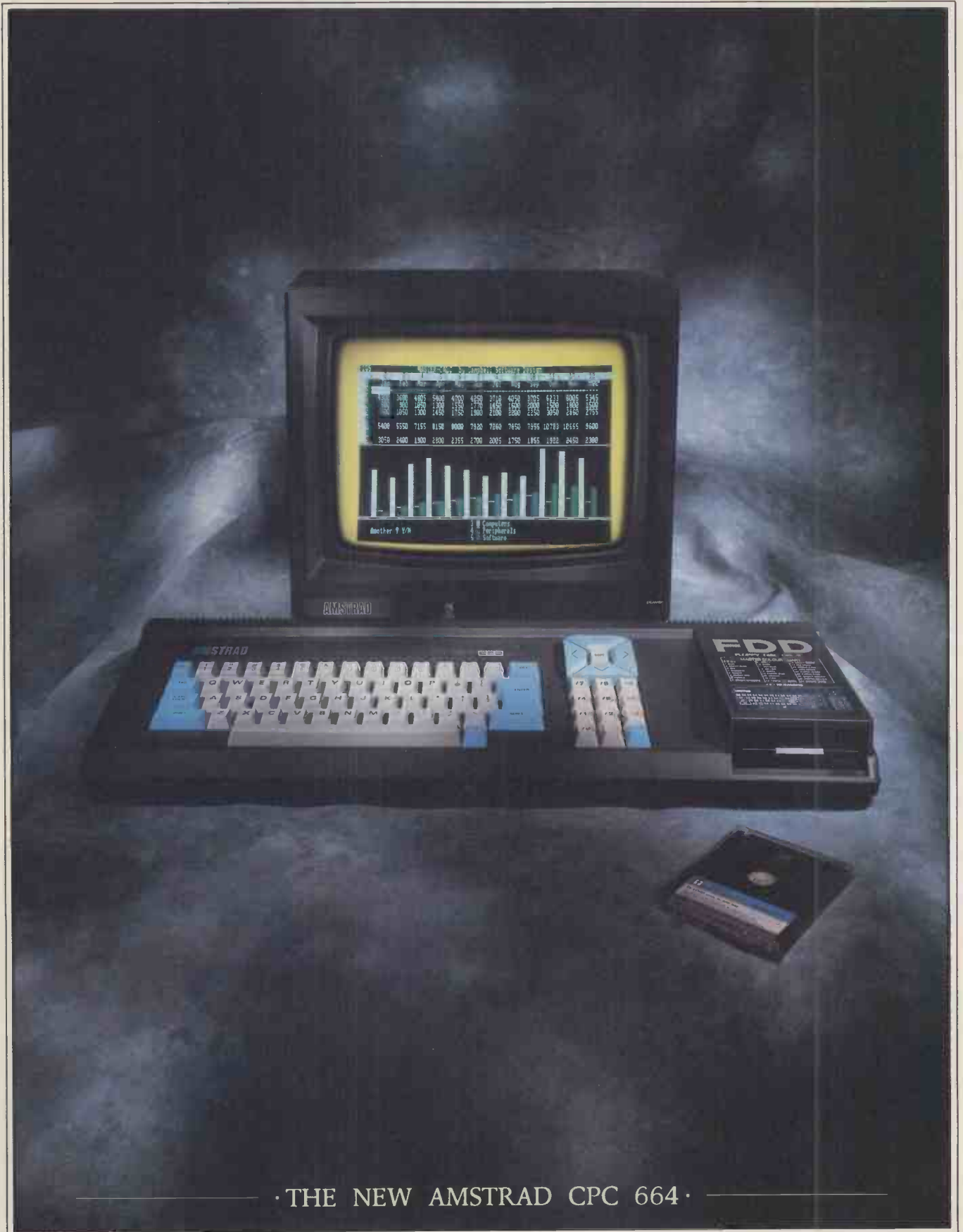
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If you know anything about computers you'll know that disc drives are up to fifty times faster than cassette when you're loading and saving programs. In fact, a disc drive makes computing faster, more reliable, more efficient and more fun. But up till now the only way to gain these advantages for a home computer was to buy a separate disc drive attachment. Now Amstrad are pleased to announce the first complete home computer with built-in disc drive: The Amstrad CPC 664.

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Although a disc drive will make games more fun (and there are loads of them to choose from) it also makes the CPC 664 a serious proposition for the business user.

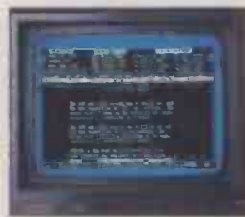
There are accounting, word-processing, spread-sheet and database programs (to name but a few).

Amsoft Business Control, is a complete suite of programs for integrated sales invoicing, stock control and sales ledger for around £99. (Requires an additional FD-1 disc drive around £159 and DL-2 cable around £7).

business more efficient and effective by providing access to the famous range of CP/M* software.

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You only have to check the cost of buying all the elements separately (64K computer, disc-drive, monitor) to realise that the Amstrad package is very hard to beat.

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These include a joystick, additional disc drive (to double your on-line storage) and the Amstrad DMP-1 dot-matrix printer. (There's also a cassette interface so that you can use CPC 464 programs on tape). And there are many more peripherals from Amstrad and other manufacturers which can be used to enhance the CPC 664.

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Please send me more information

Name _____

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Amstrad CPC 664

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ABBS London

01-373 6337
 SYSOP: Pip Cordrey
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Apple, Atari, BBC B, Buy and Sell, Commodore, CP/M, Spectrum, Tandy, The Arena

Aberdeen ITEC

(0224) 641585
 SPEED: 1,200/75 baud
 TIMES: 24 hours

Acorn

(0223) 243642
 SYSOP: Customer Services
 SPEED: 1,200/75 baud
 TIMES: 24 hours
 SIGs: BBC Micro, Econet, Electron, General Information, News, Product List, Service and Support, Special Needs, Technical Reference

BABBS 1

(0394) 276306
 SYSOP: Tony Game
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Adventure Clues, CP/M, DOS, Hardware, Macintosh, Modem Spot, Sales and Wants

BABBS 2

(0268) 778956
In the June issue of PC the telephone number published for BABBS 2 was incorrect.
 SYSOP: Mike Jones
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Adventure Clues, CP/M, DOS and Prodos, Hardware, Insults and Graffiti, Jokes, Macintosh, Modems, Pascal, Sales and Wants

BABBS Bath

(0225) 23276
 SYSOP: Mark Templeman
 SPEED: 300/300 baud
 TIMES: 21.00-08.00, 09.00-12.00
 SIGs: Messaging
 COMMENTS: ring-back BBS

Basildon Itec

(0268) 22177
 SYSOP: Tony Dwyer
 SPEED: 1,200/75 baud
 TIMES: 24 hours
 SIGs: Download Area, For Sale, Itec information, Messaging

Birmingham North

(0827) 288810
 SYSOP: Paul Smith
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Atari, BBC, Chain Letters, Hackers, Infocom, Lonely Hearts

Bloxham Bread Board

(0295) 720812
 SYSOP: Alex Crawford
 SPEED: 300/300 baud
 TIMES: 07.00-08.00, 18.00-19.00;
 Saturdays 14.00-18.00; Sunday mornings
 SIGs: Messaging

CBBS London West

(0895) 52685
 SYSOP: Iain Phillips
 SPEED: 300/300 baud
 TIMES: 00.00-18.00
 SIGs: ACT, Adventure games, BBC, Commodore, CP/M, Download Area, MS-DOS, Public, 80-Bus

CBBS North East

(0207) 543555
 SYSOP: Trevor Smith
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Messaging

CBBS South West

(0392) 53116
 SYSOP: Boyd Hitchcock
 SPEED: 300/300 baud and 1,200/75 baud
 TIMES: 24 hours
 SIGs: Download Area, Messaging, Upload Area

CBBS Surrey

(04862) 25174
 SYSOP: Mike Parker
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Download Area, Messaging, Upload Area

City Fido

01-301 4110
 SYSOP: Gully Foyle
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Download Area, Messaging

Clinical Notes Online

(0524) 60399
 SYSOP: Miles Buckingham
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Medical Notes, Messaging

Communitel

01-968 7402
 SYSOP: Bill Olivier
 SPEED: 1,200/75 baud
 TIMES: 24 hours
 SIGs: Astrology, Notting Dale Itec, Other Systems, Picture Gallery, Press Reviews

Communitree

(0874) 711147
 SPEED: 300/300 baud
 TIMES: 21.00-09.00
 FORMAT: ASCII
 SIGs: Alternative Medicine, Alternative Technology, Comments, Conference Tree, Co-ops, Crafts, Education, Events Diary, Forth, Futures, Networking, New Economics, New Village Community, Organic Food and Growing, Other Treats, Peace Network, Play for Life, Poetry, System

Compulink Fido

(06286) 63571
 SYSOP: Frank Thornley
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Adventure, Atari, BBC Acorn, Computer Widows, CP/M, Doctor Solomon, General, IBM, Lotus 1-2-3 and dBase, NEC 8201, Newsletter

CABB

01-631 3076
 SYSOP: Tony Dennis
 SPEED: 300/300 baud and 1,200/75 baud
 TIMES: 24 hours
 SIGs: Apple, BBC, Commodore, Epson, IBM, Leisure, NEC, Osborne, Packet, Politics, Survey, Tandy, Vacancies

Cymrutel Wales

(0492) 49194
 SYSOP: Ian Woodroffe
 SPEED: 1,200/75 baud
 TIMES: 24 hours
 SIGs: Accommodation, Cooking, Developments, Hardware and Software Reviews, Jobs, Ladies Area, Special Offers, Tourist Information, Welsh Language Area, What's New

Distel

01-679 1888
 SYSOP: Display Electronics Ltd
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Product Information

Distel

01-679 6183
 SYSOP: Display Electronics Ltd
 SPEED: 300/300 baud, 1,200/75 baud and 1,200/1,200 baud
 TIMES: 24 hours
 SIGs: Product Information

Estelle

(0279) 443511
 SYSOP: STC plc
 SPEED: 300/300 baud
 TIMES: 08.00-19.00
 SIGs: Catalogue Services, Enquiries, Order Progress, Orders, Product and Supplier News, Stop Press

Estelle

(0279) 441188
 SYSOP: STC plc
 SPEED: 1,200/75 baud
 TIMES: 08.00-19.00 weekdays
 SIGs: Catalogue Services, Enquiries, Order Progress, Orders, Product and Supplier News, Stop Press

Estelle

(0279) 441222
 SYSOP: STC plc
 SPEED: 1,200/1,200 baud
 TIMES: 08.00-19.00 weekdays
 SIGs: Catalogue Services, Enquiries, Order Progress, Orders, Product and Supplier News, Stop Press

Fastnet — Fido

051-260 5607
 SYSOP: Brian Williams
 SPEED: 300/300 baud
 TIMES: 22.00-08.00
 SIGs: Messaging

Forum-80 Hull

(0482) 859169
 SYSOP: Fred Brown
 SPEED: 300/300 baud
 TIMES: 19.00-22.00, Tues. and Thurs., 13.00-22.00 Sundays
 SIGs: Download Area, Messaging, Upload Area

Forum-80

(0926) 39871
 SYSOP: M J Randle
 SPEED: 300/300 baud
 TIMES: 23.00-00.00
 SIGs: Messaging, News

Gnome at Home

01-888 8894
 SYSOP: Micrognome
 SPEED: 1,200/75 baud
 TIMES: 24 hours
 SIGs: Messaging, Viewdata Editing

Hamnet

(0482) 497150
 SYSOP: John Lawrence
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Download Area, Messaging, Upload Area

LBBS

(0524) 822336
 SYSOP: John O'Connor
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Adventure, Apricot/Sirius, BBC, CP/M, Download Area, Hacking, Jokes, Messaging, Sales, Upload Area

Livingston BBS

(0506) 38526
 SYSOP: Ray Agostino and Mark Simkin
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Messaging

Mailbox 83

(0384) 635336
 SYSOP: Jim Roden
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Apple II, Atari, BBC,
 Dragon, IBM PC, Osborne,
 TRS-80, Vic-20

Mailbox-80

(0514) 288924
 SYSOP: Peter Toothill
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Adventure, Apple, Atari,
 BBC, CP/M, Dragon/TRS-80
 Colour, IBM PC, Micro-Wave,
 Modems, TRS-80

Maptel

(0702) 552941
 SYSOP: Maplin Electronics Ltd
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Atari Club, Computer
 News, Electronic Magazine

Marctel

01-346 7150
 SYSOP: Marcus Anselm
 SPEED: 300/300 baud
 TIMES: 20.00-21.00 weekdays,
 16.00 Saturdays, 13.00-16.00
 Sundays
 SIGs: Messaging

MBBS

01-648 0018
 SYSOP: Martin Newham
 SPEED: 300/300 baud and
 1,200/75 baud
 TIMES: 24 hours
 SIGs: Download Area, Messaging

MG-NET

01-399 2136
 SYSOP: Peter Goldman
 SPEED: 300/300 baud
 TIMES: 17.00-22.00 Sundays
 SIGs: Download Area, Messaging

Microlive

01-579 2288
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Microlive

Microweb

061-456 4157
 SYSOP: Mike Bibby
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: BBC, Download Area,
 News, Problems

MOBBS

061-736 8449
 SYSOP: Ken Farnen
 SPEED: 300/300 baud and
 1,200/75 baud
 TIMES: 24 hours
 SIGs: Acorn, Adventures, Apple,
 Atari, Commodore, CP/M, For
 Sale/Wanted, Gossip, Hardware,
 Help, Jokes, Languages,
 Modems, Spectrum, Tandy

NBBS East

(0692) 630186
 SYSOP: Jonathan Freeman
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Download Area,
 Messaging, Upload Area

NBBS Essex

(0277) 228867
 SYSOP: Jason Tanner
 SPEED: 300/300 baud and
 1,200/75 baud
 TIMES: 24 hours
 SIGs: Messaging

NKABBS

(0795) 842324
 SYSOP: Dave Frost
 SPEED: 300/300 baud
 TIMES: 21.00-00.00
 SIGs: Applications Software,
 Communications, Download
 Area, Graphics, Messaging,
 Music, Upload Area, Utilities
 COMMENTS: ring-back system

OBBS 1

061-427 1596
 SYSOP: Robert O'Donnell
 SPEED: 300/300 baud
 TIMES: 22.00-17.00 weekdays,
 22.00-10.00 weekends
 SIGs: Adventure, Apple, BBC,
 Download Area, Games,
 Graphics, Hackers, Jokes,
 Problems

OBBS 2

(0244) 549336
 SYSOP: Paul Roberts
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Adventure, Apple, BBC,
 Download Area, Games,
 Graphics, Hackers, Jokes,
 Problems

Octopus

(0272) 421196
 SYSOP: Peter Evans
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: CP/M, News, Merchandise,
 Topical Interest

OSI Lives

01-429 3047
 SYSOP: Frank Leonhardt
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Messaging
 COMMENTS: ring-back system

PIP

(0742) 667983
 SYSOP: Quentin Reidford
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Adventure Clues, Apple,
 Apple Mac, BBC, CP/M, DOS,
 Fantasy Area, IBM PC, Modem
 Spot, MUD, Oric, Sales and
 Wants

Planet

(0525) 717148
 SYSOP: Andy Green
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Messaging

React

(0376) 518818
 SYSOP: George Lloyd
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Adverts, Dragon,
 Noticeboard

SABBS

(0698) 884804
 SYSOP: Nick Rosser
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Atari, BBC, Download
 Area, News

Sanctuary

(0784) 38110
 SYSOP: Barry Brumitt
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Apple, Atari, BBC,
 Commodore 64, Diplomacy,
 Download Area, Macintosh,
 Modem Talk, Spectrum, Stories,
 Upload Area

SBBS

(0923) 676644
 SYSOP: Simon Talbot
 SPEED: 300/300 baud
 TIMES: 21.00-08.00
 SIGs: Apple, BBC, Commodore,
 Download Area, Graffiti, Hackers
 Club, Help Hotline, Sales and
 Wants, The Music Man, Upload
 Area

Southern BB

(0243) 511077
 SYSOP: Jonathan Sanders
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Atari, BBC, Bulletins,
 Communications, Download
 Area, For Sale, Games, Hackers,
 Zork

Stoke Itec

(0782) 265078
 SYSOP: Ian Hickman
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: CP/M

TBBS

01-348 9400
 SYSOP: John Newgas
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: BBC, C/Forth/Pascal,
 Chain Letters, Computer Trade,
 Gossip, CP/M, Diplomacy,
 Graffiti, Hackers Club, Magazine
 Section, Politics, Portable Spot,
 Radio Comms, Sales and Wants,
 Surveys, The Swamp, Toy
 Shoppe



BY BEN KNOX

BULLETIN BOARD SERVICES

TBBS

(0258) 54494
 SYSOP: Leo Knaggs
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Apple, Atari, BBC,
 Commodore 64,
 Modems/Communication,
 Newbrain, Sales and Wants,
 TRS-80, Unspecified

Techno-line

01-452 1500
 SPEED: 300/300 baud and
 1,200/75 baud
 TIMES: 24 hours
 SIGs: Products

The London Underground

01-863 0198
 SYSOP: Brian Robinson
 SPEED: 300/300 baud and
 1,200/75 baud
 TIMES: 24 hours
 SIGs: Communications Corner,
 International News, Messaging,
 Muddy Patch

TUG

01-205 9930
 SYSOP: Steve Froeschke
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Membership list, Messaging

WABBS

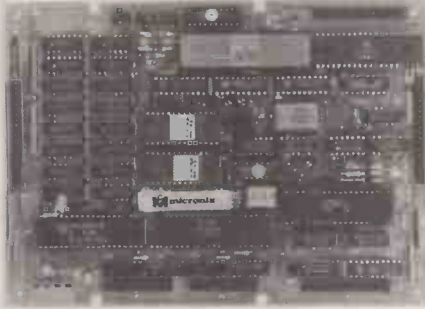
(0903) 42013
 SYSOP: Richard Harvey
 SPEED: 300/300 baud
 TIMES: 24 hours
 SIGs: Atari, Communications,
 Download Section, Games,
 General, Graphics, Upload Area,
 Utilities
 COMMENTS: ring-back system

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Board (recommended for OS9/68000) £199 + VAT = £228.85 - OS9/68000
real time, multitasking, multiuser Operating System (similar to UNIX)
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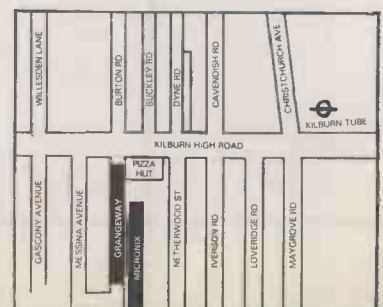
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BY RAY COLES

SEMI-CUSTOM CIRCUITS

The cost of putting your own tailor-made chip designs into production has fallen dramatically.

modem link or on magnetic tape, so that a metallisation mask can be produced and the chips completed to the required design. This process might take several weeks, but it is still very competitive with the more traditional method of first breadboarding, then taping up a printed-circuit board design to suit, manufacturing the boards, and finally adding yellow wire to fix any residual bugs.

The PC-based CAE work station approach offers a most attractive alternative to design engineers, and virtually guarantees that their designs will work first time. As a bonus, the resulting design usually costs less, takes up less board space, is impossible to copy, and is more reliable into the bargain. Is it any wonder that design engineers are discarding their microprocessor manuals and taking the gate array data to bed instead?

The current state of the gate array art can provide chips with up to 6,000 gates — enough to build your own microprocessor, if that turns you on. The most popular gate-array technology is HCMOS, offering gate delays of 3 nanoseconds or less with 3 micrometre gate widths.

A popular current use of gate arrays is as the system chip in popular micros such as the Spectrum and the Amstrad, where most of the system glue logic and a number of special peripheral functions are collected together as a single chip. In the future though, gate arrays are going to be put to many more mundane — or more bizarre — uses as more and more engineers decide to take the plunge.



In the electronics business at the moment, microprocessors are being toppled from their long-occupied position as the number 1 glamour technology. Does this mean the end of the personal computer as we know it? Are microprocessors going the same way as the hula-hoop and the skateboard, consigned forever to the scrap heaps of fickle human fashion?

Fortunately, the answer is no. Personal computers and microprocessors are here to stay. But paradoxically it is the very availability of powerful 16-bit microprocessors, and the personal computers which use them, that has been responsible for the proliferation of the semi-custom gate array technology now competing for design engineers' attention.

The evolution of the microprocessor and its cohorts develops apace, with engineers continuing to employ them in increasing numbers of new products. The problem, if it can be considered to be one, is that everyone now knows about microprocessors, and the evangelical zeal has gone out of the microprocessor disciples of yesterday. Microprocessors are being improved, and they are being widely used, but their very popularity has made them just another boring component.

GREAT EXPENSE

The trouble is that microprocessors are standard VLSI building blocks. They have been developed at great expense behind the semiconductor manufacturers' closed doors, and the teams of dedicated people who have designed them appear to employ techniques comparable to alchemy and witchcraft, judging by all the secrecy involved in the process. The ordinary electronics engineer doesn't get so much as a smell of the chip-design process, and certainly has no control over it. When the semiconductor manufacturer finally takes the wraps off his new microprocessor, the engineer has a choice — any colour, so long as it is black.

Not many engineers actually yearn to design their own microprocessor, but they would like at least a small piece of the action. It is just this that the sexy new semi-custom technology offers.

As VLSI chip designs become increasingly complex and take on more and more system functions, they also become more and more specialised. Unfortunately, applications are all different and cannot ordinarily be satisfied by a standard VLSI chip. Memory size and types vary, the number of input/output channels vary, peri-

pheral needs vary, and the end result for most systems is that the highly complex VLSI chips often appear as tiny rafts afloat in a sea of low-complexity "glue" logic.

Board reliability — and perhaps even more important, board cost — are both very much dependent on the number of individual devices used, and so a single VLSI microprocessor package containing 95 percent of the circuitry surrounded by dozens of SSI glue-logic packages is not a terribly attractive proposition. Even when lashings of glue logic can be tolerated, there is still an in-built problem: the ease of reverse-engineering by competitors, who can see every intimate detail of the system circuitry on show.

The solution to all of these difficulties would be an extension of chip design capability from the multi-million dollar design labs of the chip manufacturers right on to the individual system designer's desk. This is exactly what semi-custom offers, and is the reason why it is the glamour technology of the moment.

The semi-custom gate array relies on the initial production by semiconductor manufacturers of wafers made up of identical chips, each covered in hundreds or thousands of logic gates, the basic building blocks of all digital circuits. Wafers composed of gate-array chips can be stockpiled, ready to receive the final layers of metallisation interconnect which will turn them into unique functional circuit elements for a specific application.

The fabrication of logic integrated-circuit wafers is a multi-phase process which consists of alternating photo masking, etching and diffusion steps, each carefully controlled. By comparison with all that goes on before it, the final customising metallisation process is straightforward. It can be performed long after the other steps if necessary.

When the gate array manufacturer receives a new logic schematic design from one of its customers, it prepares a custom metallisation pattern to im-

plement the required circuit. The pattern is then applied to as many of the stockpiled wafers as may be necessary to complete the order. The chips are probe tested, sawn from the wafers and finally packaged in the normal way.

The important thing about this process is that it uses simple design tools and is relatively inexpensive. Just a few thousand pounds is enough for the implementation of each new design. By comparison, a completely unique full-custom design might cost hundreds of thousands of pounds and require the use of complex chip design facilities only available to very large corporations.

Gate arrays, then, are accessible to a much wider spectrum of engineers, and can be used even on small projects which require hundreds of individual devices, rather than tens of thousands.

So far so good: but surprisingly, perhaps, this kind of gate-array technology is not new. It has, in fact, been available since the 1970s, so why should it suddenly be turning engineers' heads in 1985?

WHERE TO BEGIN

There are two main reasons. First, thanks to the new HCMOS process, gate arrays have become bigger, faster and easier to use. Second, whereas in the past gate array design required a very expensive CAE work station or even a mainframe computer, today the design can be carried out by an engineer at his or her desk, using an IBM PC/AT or one of the many compatibles now becoming available.

The design process starts with the engineer entering the logic schematic or circuit diagram of the system he or she wishes to build, using a special graphics package and a mouse. Next the designer tests the new creation using a logic-simulation software package, and checks that it will perform correctly and that the timing criteria are met.

If all is well, the finished design can be transmitted to the semiconductor manufacturer, either by



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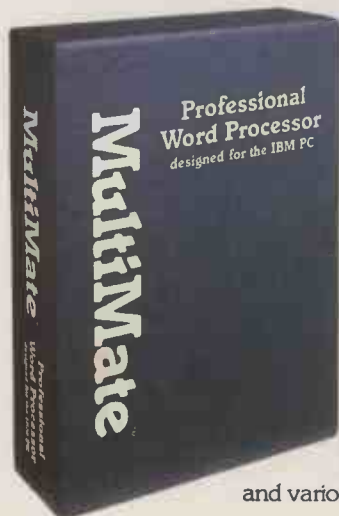
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BY MIKE LEWIS

LOOKING INTO WINDOWS

You can write your own routines to produce windowing on a memory-mapped display.

spoolers, keyboard enhancers and even multi-function tools like Borland International's Sidekick. Windows are essential if these programs are to talk to the user without messing up the screen for the main application.

Another advantage is that library modules can be made more independent if their dealings with the user are always through windows. For example, suppose that you want to provide detailed error messages in a data-entry program. The message is to take up quite a lot of space, but must not obscure the field containing the error. As soon as the error is corrected, the display must be restored.

MECHANICS HIDDEN

One way of achieving this would be to use a standard routine, the parameters of which are the message number and the screen co-ordinates of the location of the message. On detecting the error, the calling program would invoke the routine, which would in turn open a window, display the message, and return control. Later, the program would call another routine to close the window. The advantage is that your data-entry screens would not have to be designed with the messages in mind, and the mechanics of window opening and closing can be hidden from the main process.

Although you should be able to program such window routines fairly easily, it is not so easy to make them portable across different types of hardware. It's true that MS-DOS has a system call for a simple window feature, but

(continued on next page)

WINDOW DEMONSTRATION ROUTINE

```

5000 ' Subroutine to open a window, display a message, then close the
      ' window. Note that this is very IBM-specific; general technique
      ' applies to other hardware but details will need revising.
5010 '
      ' On entry: ROW,COL are co-ords of top-left corner of window;
      ' E.ROW,E.COL are co-ords of bottom-right corner;
      ' MESSAGE is the message number; M.ROW,M.COL say where the
      ' message is to be printed relative to the window
5020 '
      ' Assumed that calling program has following statements:
      ' DIM STORE(4000)      area to hold saved screen data
      ' DIM MESS$(x)        a list of all possible messages
      '           e.g. MESS$(1)="Cannot find required file"
5030 ' DEF FNOFS(R,C)=R*160 + C*2
      '           this is a function to convert screen
      '           co-ords to offsets within screen memory
      ' All variables are integers except where indicated by $
5050 '
5060 ' ST.MESS$="Press any key to continue."
      ' A standard message which is always printed
5070 ' BORD=178           'Grey block for making borders
5080 ' DEF SEG=&H8B00     'Start of screen memory for IBM colour/graph;
      '                   for monochrome, change to &H8000

5090 '
5100 ' J=0
5110 ' FOR R=ROW TO E.ROW:
      '   FOR C=COL TO E.COL:
      '     STORE(J)=PEEK(FNOFS(R,C)):
      '     STORE(J+1)=PEEK(FNOFS(R,C)+1):
      '     J=J+2:
5120 '   NEXT C:
      '   'Save existing screen chars. and attributes
      '   'from "under the window"
5130 '
5140 ' FOR R=ROW TO E.ROW:
      '   FOR C=COL TO E.COL:
      '     POKE FNOFS(R,C),32:
      '     POKE FNOFS(R,C)+1,112
5150 '   NEXT C:
      '   'Clear window to spaces; set attribute
      '   'to inverse video
5160 '
5170 ' FOR C=COL TO E.COL:
      '   POKE FNOFS(ROW,C), BORD:
      '   POKE FNOFS(E.ROW,C), BORD:
      '   NEXT C
5180 ' FOR R=ROW+1 TO E.ROW-1:
      '   POKE FNOFS(R,COL), BORD:
      '   POKE FNOFS(R,E.COL), BORD:
      '   NEXT R
      '   'Print the border
5200 ' THIS.MESS$=MESS$(MESSAGE)
      ' Extract required message
5210 ' FOR J=1 TO LEN(THIS.MESS$):
      '   CHAR=ASC(MID$(THIS.MESS$,J,1)):
      '   POSIT=COL+M.COL+J-1
5220 '   'Extract next char from message and calculate
      '   'its absolute column number
5230 '   POKE FNOFS(ROW+M.ROW,POSIT), CHAR
      '   'Print the character
5240 '   NEXT J
5250 '
5260 ' FOR J=1 TO LEN(ST.MESS$):
      '   CHAR=ASC(MID$(ST.MESS$,J,1)):
      '   POSIT=COL+M.COL+J-1:
      '   POKE FNOFS(ROW+M.ROW+2,POSIT), CHAR:
5270 '   NEXT J
      '   'Print the "press any key" message two
      '   'lines down
5280 '
5290 ' X$=INPUT$(1)
      ' Wait for keystroke
5300 '
5310 ' J=0:
      ' FOR R=ROW TO E.ROW:
      '   FOR C=COL TO E.COL:
      '     POKE FNOFS(R,C), STORE(J):
      '     POKE FNOFS(R,C)+1, STORE(J+1)
      '     J=J+2:
5320 '   NEXT C:
      '   'Restore saved screen chars and attribs
5330 ' DEF SEG
5340 ' RETURN

```

more, the whole operation can be performed while your payroll is calculating in window number four. Some deft fingering of the function keys will hide the payroll data while you are doing the copying, then bring it back to fill the screen when you wish to give it your undivided attention.

Given suitable hardware, it is not difficult to develop a windowing technique that you can use in your own programs. Its aims would be to allow a window to be opened anywhere on the screen, to output data to it, and to restore the

display to its former appearance as soon as the window is closed. If you are feeling a little more ambitious, you could allow the user to move the window around, and even make it overlap with other windows.

A SIMPLE JOB

One advantage of such a technique would be to simplify the job of writing co-resident applications. These are small programs that lurk in the far reaches of RAM while the more important software is running. They include print

It's not surprising that windows are all the rage these days. After all, different types of data have different shapes. So why should the information that we see on our screens always have to be coerced to fit a rectangle of 24 or 25 lines by 40 or 80 columns? And why should we be stuck with just one view at a time? We all know what it is like to have to close down the job in hand simply to glance at some unrelated piece of information. There are times when the computer seems less convenient than old-fashioned pieces of paper.

Windows, if carefully designed, can bring that convenience back to the computer screen. You only have to use one of the latest window-based substitute operating systems, like the Macintosh Finder or Gem Desktop, to appreciate their virtues. Their ability to show you several directories or file listings side by side is a vast improvement over the ever-scrolling Teletype-like displays of raw MS-DOS and CP/M.

SEVERAL PROGRAMS

Some systems go even further. The most recent versions of Digital Research's Concurrent CP/M allow you to run several programs at the same time, each in its own window. This operating system used to be compared to a television with four channels. With windows, you can watch them all simultaneously.

This prospect might evoke in you a measure of alarm, especially when you consider that many application packages are themselves window-based. Do we really want to work in a Framework window within a DOS window alongside a Multiplan window in front of . . . ?

Actually it's not quite as bad as that. For example, consider the simple task of copying a dozen or so unrelated files from one disc to another. Using plain CP/M, this would involve listing the directory, invoking Pip, scanning the directory for the first file, entering the command, and waiting for the prompt to reappear. You would then look for the next file and repeat the process. The trouble is that well before you were halfway through, the directory would be scrolling off the screen, so you would have to exit Pip and do another Dir.

In Concurrent CP/M with windows, the problem is solved by invoking Dir in one window and Pip in another. Only the Pip commands would scroll. If you run out of space on the destination disc, you can delete files from within a third window. What's

(continued from previous page)

this is very limited and is not easy to get at many high-level languages. Similarly, there is a window procedure in Turbo Pascal, but only in its IBM versions. Nor is Microsoft Basic's Window statement very useful because it is only available in a graphics environment.

Nevertheless, Basic can be used to illustrate the technique. First, you need to get to grips with your computer's screen memory. This is an area of RAM which you can think of as being directly wired to the video display. Writing data to the appropriate location in RAM makes it instantly visible on the screen. Also you can read data from the memory to find out what is showing on the display.

The architecture of screen memory varies a lot from one computer to another. My sample program is based on the IBM method, but the general techniques can be adapted for other hardware. In the IBM PC and most compatibles, the screen memory is a continuous block of 4,000 bytes, starting at location B000 for a monochrome adaptor or B800 with colour/graphics. There are two bytes in memory for each screen character: the first is for the data itself and the second for the attribute.

The attribute is a code which determines the character's background and foreground colours. In monochrome systems, the codes translate to various combinations of inverse video, flashing, underlining and high intensity. The point is that when you close a window, you have to restore the previous attributes along with the data, so both bytes must be held safe somewhere.

We are now in a position to write a general-purpose window module. To open a window, the calling program would supply the location on the screen where the window is to appear, in the form of row and column co-ordinates of the top-left and bottom-right corners respectively. It might also specify the window attributes or colours, and perhaps the type of border. The IBM extended character set has a number of box-drawing shapes which are useful for borders, or you could stick to a simple grey shaded bar.

SPACES IN RAM

The window routine would start by copying the existing data and attributes from the relevant part of the screen memory to a suitable array. Then it would clear the window by placing spaces in the screen RAM, perhaps dealing with attributes and the border at the

same time. Next, it would print the required data in the window. When it is time to close the window, the saved data would be copied back into the screen memory.

ADAPTING THE MODULE


The listing shows a routine which does just this. Since the program frequently has to convert from row and column numbers to byte offsets within screen memory, it is handy to define a function for performing this calculation, as in line 5030. This line, and the nearby Def Seg in line 5080, are the most important items to recode when adapting the module for other hardware.

The area which holds the saved data and attributes is a simple one-dimensional character array. If you want to take the more sophisticated approach of having several overlapping windows, you could store the relevant blocks end to end in this same array, adding a second table, this time of integers, holding pointers to the beginning of each block. Incidentally, the programming will be less complicated if you are careful always to close windows in the reverse order to that of opening.

Although do-it-yourself windowing is perfectly feasible in

Basic, be warned that it can be very slow. The section of code which copies data between the screen and the array will take several seconds to run, especially if the window is large. As usual, I have chosen Basic simply to illustrate the general approach. In practice, it would be much better to use a compiled language, especially one which supports block moves.

If you want to adapt this sub-routine for different hardware, study your machine's manual carefully. In some systems, screen memory is not contiguous, and the handling of attributes and colours varies a lot as well. Of course, the technique will only work with memory-mapped displays, so if your computer uses a terminal connected through a serial port, I am afraid you are out of luck.

Many professional programmers frown on the practice of writing application software that depends on specific hardware characteristics and addresses. They rightly point out the difficulties that will arise if the manufacturer decides to change these features. But as far as the IBM family is concerned, many of the best-known packages use the screen memory as discussed in this article. They include dBase III, Microsoft Word, Framework, Symphony, and many more. So at least we are in good company. 



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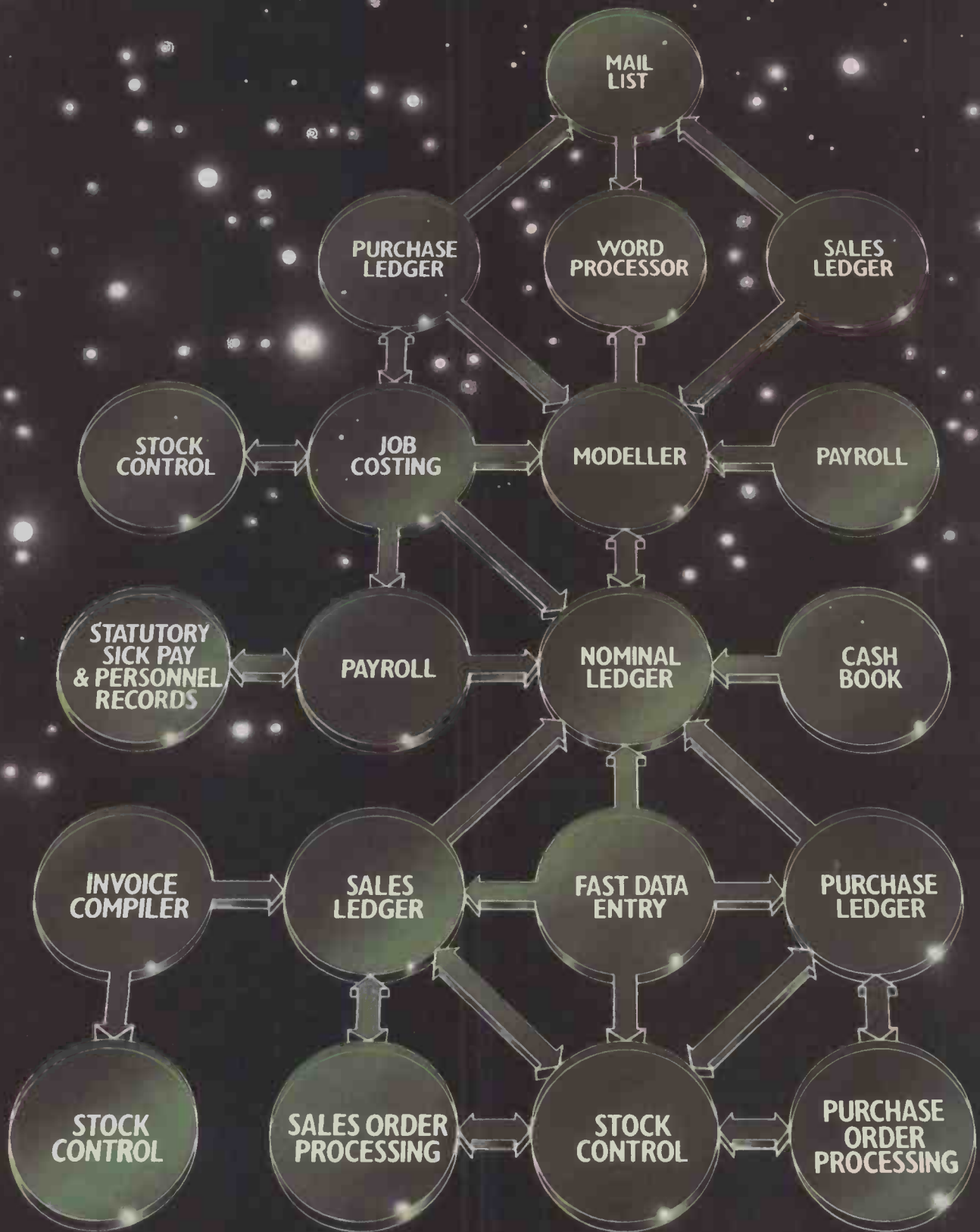
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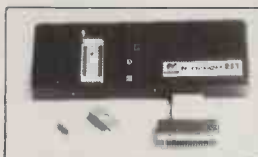
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This type of blind auction parallels in the tendering for contracts, where you must also offer some goods or services at a suitable price, without knowing what price your competitors are quoting. The psychoeconomic model is mirrored in this month's game. I think that any technique which enabled a computer program to play this game well could also be used by companies whose business involves tendering.

PSYCHOLOGY

As far as I know, the game has no name. I was shown it more than 20 years ago by a colleague on the chess circuit who in turn had been taught the game by C H O'D Alexander, another international chess player and one who had worked with Turing in the famous code-breaking hut at Bletchley Park during the Second World War. The game combines the psychological aspects of trying to guess what your competitors are bidding with the economic problem of knowing how much you ought to be willing to pay or be paid for something.

The game may be played by any number of people. Each player has one complete suit of 13 cards. If there are more than three players you can simply use more than one deck of cards — the suits have no relevance. In addition there is one complete suit which is used as the commodity stack. I shall describe the game for two players.

The commodity stack is shuffled and placed face down on the table. The top card is turned over and each player must bid for it. The value of the commodity card is

linked to its rank: king counts as 13, queen 12, jack 11, 10 10 and so on, down to the ace which is the lowest card and counts as 1. Similarly, the cards in each player's hand are ranked king down to ace.

In order to bid for a commodity card, each player takes one of the cards from his own hand and places it face down on the table. When all of the bids have been made, the players turn over their cards and the one whose card is highest takes the commodity card. If two or more players bid the highest rank for the commodity card, they share its value. When all of the commodity cards have been purchased, the hand is over and the players add up the values of the commodities they have bought.

You can keep score on the basis that winning one hand counts as one point, or you can keep a running total for each player of the commodity values acquired, and specify that the first to reach a certain total is the winner.

RIGID STRATEGY

The psychological aspect of this game is in many ways more important than the economic one, since if you played purely on the basis of economics, your opponent would always win by taking advantage of a rigid strategy. For example, if your opponent always bids exactly what a card is worth, that is king for king, queen for queen, jack for jack, etc., you would always win each hand by a big margin. Simply bid the ace for the king, and one more than the value for every other card. With this strategy you will lose the king worth 13 points, but pick up all of the other cards worth 78 points.

A good player will vary his strategy for two reasons. First, if he is too predictable his opponent will quickly learn how he plays and will take advantage of his playing style. Secondly, the better player will monitor his opponent's playing strategy and adjust his own accordingly. If your program is given the ability to learn how its opponent plays, it will make a very interesting and worthwhile opponent. If the program's playing style is too rigid, it will soon become predictable and the game will lose its lustre. If your program is able to learn, you must endow it with the ability to store the values of certain key variables from one playing session to the next.

When a player loads the program and is ready to start a game, the program should ask for his name and should then assign a set of the key variables to this player. As the game progresses the values of these variables will

change according to the style of the player, and when the playing session is over the program should dump a file containing these values on to cassette or disc, ready for the next playing session. When the program recognises a name from a previous game or games, it loads in the information about that player's style which it has gleaned from previous encounters and uses it.

Consider how the program might learn so that it can modify the variables during the course of play. One important aspect of computerised learning is that the program should be able to weight recent experiences more heavily than experiences from the distant past, so that it can adjust its own style of play in accordance with sudden changes in its opponent's style. This can be accomplished by the use of an overall variable and a recent variable for each situation that is being monitored.

During the play of a hand the program uses only the overall value for the variable, but at the end of the hand it adjusts this value by using the equation:

$$\text{new overall value} := ((N \times \text{old overall value}) + \text{recent value}) / (N + 1)$$

If N is chosen to be low, say 1, the program will be extremely sensitive to recent changes in style by the opponent. As N gets larger and larger, so the sensitivity to the recent past becomes less and less. You could make N a user-selectable parameter, so as to offer the human player a choice of playing style and level of difficulty.

If N is set to be extremely high, the program will learn so slowly as to be imperceptible, and the human player will be able to adapt to the program's style more readily. This situation is ideal for beginners. Once the human player finds that the program can be

BY DAVID LEVY

BLIND AUCTION

Buying a house and tendering for a contract are both mirrored by this bidding game.

beaten regularly, N should be reduced.

Now consider what variables the program needs to learn. Assume that you assign to each commodity value an offset variable, which indicates the rank difference between the value of the commodity and the value of the card used to bid for that commodity. These values could be called KOff, QOff, JOff, 10Off, 9Off, ... , AOff. The value of JOff would depend on the values of the cards, relative to the jack, which were used by the human player when bidding for the jack. If the human always bid his queen for the jack, the value of JOff would always be + 1. If the human always bid the 9 for the jack, JOff would be - 2. If the human's bid varied, JOff would be the average offset.

(continued on next page)



(continued from previous page)

The program should start life with some preconceived values for the offsets. You might as well make life easy for people the first time they play the game by making each offset 0. The program will then assume that an unknown human player will always bid exactly the commodity value for each card. The program starts life with two variables for each offset, the overall value and the recent value. The overall value is the variable which is remembered, and the recent value is merely used to update the overall value at the end of each hand.

You can now develop a simple playing strategy based on the stored information. When a commodity card is turned face up, the program estimates what card the human opponent is likely to bid for it, based on the overall value of the offset. The program then chooses to either play its lowest card or play the next card in its hand above the opponent's expected card. If it does not have a higher card it plays the same denomination, or if it does not have the same denomination it plays its lowest card.

The choice between these two decisions can be made on the basis of a primitive evaluation function,

which can be applied to each possibility

$$\text{Value of Commodity Card} + W \times (\text{Holding Difference}) \times (\text{Remaining Commodities})$$

where Value of Commodity Card means just that, unless the decision is to play the lowest card in which case it is 0, since the program does not expect to win the bidding. Holding Difference is the difference in the average remaining holding between the program and the human player, after making the bid under consideration, assuming that the human player makes the expected decision. Remaining Commodities is the average commodity value for the remaining cards in the commodity stack after this bid. W is a weighting factor.

For example, the commodity card is the 9, and the remaining cards in the commodity stack are the 5 and the 3. The human player currently holds K, 9, 4 and is expected to bid the 9. This would leave him with the K worth 13 points and the 4 worth four points, for an average remaining holding of 8.5 points. The computer currently holds the Q, 6 and 5, and is therefore deciding between playing the Q, which is the lowest card higher than the human player's expected 9, and the 5. The

evaluation of each decision can now be made.

If the program bids the Q then its average remaining holding will be 5.5. The human is expected to play the 9, leaving him with an average holding of 8.5. The remaining commodities will have an average value of 4. The evaluation of this decision gives

$$9 + W \times (5.5 - 8.5) \times 4 = 9 - 12W$$

If the program bids the 5 its average remaining holding will be 8. The evaluation of this decision gives

$$0 + W \times (8 - 8.5) \times 4 = -2W$$

In order to make its decision, the program simply compares the values of $9 - 12W$ and $-2W$. The value of W may be chosen by trial and error, or you could play two versions of the programs against each other, each using a different value of W, and determine the optimal value of W by experiment.

This method can be made more accurate by retaining 13 pairs of variables associated with each commodity value. Each pair of variables would indicate the frequency or probability associated with the user's bidding a particular denomination for a certain commodity value.


For example, the program would consider 13 different situ-

ations when the commodity card was a K: the user bid the K, the user bid the Q, the user bid the J, . . . , the user bid the A. These 13 frequencies or probabilities would be updated at the end of each hand, and would enable the program to evaluate each decision in a more accurate manner. What would happen is that the term Value of Commodity Card would be replaced by Expected Value of Commodity Card. For any biddable card this is defined as

$$\text{Actual Commodity Value} \times \text{Probability of winning the bid}$$

Thus, in this case the program would estimate the three probabilities for the human player bidding the K, the 9 and the 4, and would compute its evaluations based on these calculations. The term Holding Difference will be different in each of the three cases, and the evaluation function will be the sum, over all biddable cards that the user may bid, of:

$$\text{Actual Commodity Value} \times \text{Probability of winning the bid} + W \times (\text{Holding Difference if the human bids this card}) \times (\text{Remaining Commodities})$$

With this level of sophistication and a suitable choice for the value of W, the program can become a formidable opponent. 

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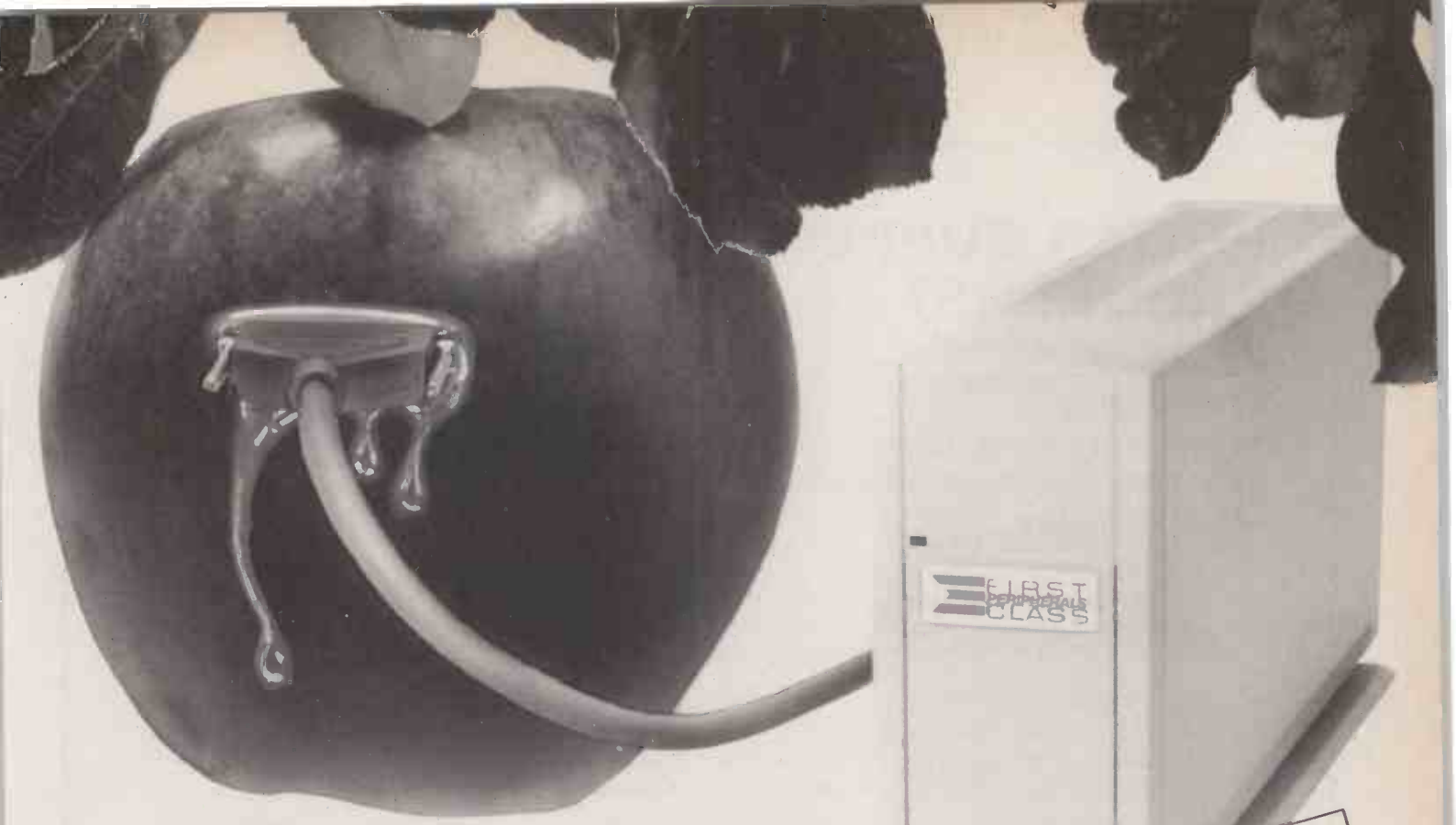


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BOOK REVIEWS

ANYONE setting out to write a home micro book on artificial intelligence programming faces a number of problems. One, obviously, is the limited size and power of the machine; another is the Basic language.

Some AI techniques can be demonstrated in miniature on a machine with a small memory. This is the case when a method depends on clever reasoning or neat algorithms. Simple learning by example or robotic vision algorithms might come in this category. You can demonstrate the full power of the technique on a micro, but you may find you are restricted to very small problems.

Other AI techniques will perform disappointingly on a micro because they need vast quantities of knowledge. For example, language translation needs dictionaries of thousands of words and much other knowledge besides. So unless your machine has hard discs and megabytes of memory you are only going to get Mickey Mouse translation programs.

Also it is no joke writing AI programs in Basic. Real AI problems are not just big, they are complex. Mere iteration — doing the same thing over and over — won't solve them. Your program has to be able to grow not only to the size, but to the unique shape of each fresh problem you fling at it. You need procedures, which are easily reused for different purposes, rather than the less adaptable subroutines. Your procedures have to be able to create fresh copies of themselves as and when needed. You need recursion.

Basic does not usually supply the necessary tools. Most professionals use Lisp. Serious alternatives for the micro user are Logo and Micro Prolog, with runners-up Pascal and, would you believe, BBC Basic?

Sadly, no one seems to have written an AI book which uses the power of BBC Basic. The trouble is that machine-specific books these days tend to be semi-custom jobs.

The term "artificial intelligence" is fast being devalued, but Tony Durham separates the wheat from the chaff as he sifts through some books on the subject.

REAL AI

Essentially the same text and programs are dished up for three or four different machines, with only what computer scientists call the syntactic sugar altered. This reduces all Basics to the lowest common denominator.

People seem to be easily impressed by programs which come back with snappy answers to the things you type in. Just about every micro AI book includes a program modelled on Joseph Weizenbaum's Eliza. Eliza produced a devastating imitation of the way a psychotherapist talks to a client, mainly by regurgitating the user's words, slightly rearranged, and by padding out with stock phrases.

It is great fun to play with this kind of program. Indeed, fun is not always the right word. A program called Parry, the real-life prototype of Marvin the paranoid android, was available on the Arpanet computer network in the early 1970s. With this one you were the psychiatrist and the computer was the jumpy, suspicious patient. Parry really knew how to get up people's noses, and an enraged friend of mine once typed in: "I've got a gun. Bang! You're dead." Parry did not get the message and drivelled on about how he was being ripped off by the Mafia.

Tim Hartnell's *Exploring artificial intelligence* books put these programs in their context. Hartnell relates how the author of Parry, Kenneth Colby, thought they had genuine clinical uses, while Weizenbaum was shocked at the way people were taken in by such simple tricks.

Jones and Fairhurst's *Artificial intelligence: ZX Spectrum* also makes it clear that Eliza does not have a clue what it is talking about. But other less perceptive writers slur over this point. Weizenbaum's own blast against the misunderstanding and potential abuse of AI is now widely available, thanks to a timely Penguin reprint.

Tim Hartnell has made an honest attempt to scale down serious AI programs to a size suitable for typing into a micro. There is a complete draughts program. There is a tiny version of Terry Winograd's Shrdlu, a program which really tried to understand language. Shrdlu stacked and



sorted imaginary blocks in response to commands. It was good at disambiguating language — working out, for example, which block you meant when you said "it". Shrdlu also had some ability to plan courses of action.

Hartnell's big section on language also includes a light-hearted Franglais translator and a random poetry generator. Learning by example is another strong theme, but the programs given use a form of parameter learning which is neither very powerful nor very general.

The original version of Hartnell's book used Microsoft or MSX Basic, leaving many home micro owners the chore of converting programs to run on their own machines. Its three appendices suggested further reading, offered valuable hints on programming, and gave translations of computer jargon.

The new machine-specific editions are printed in a more attractive typeface and cost £2 more, but the appendices have sadly gone.

Some computer books give you the doubtful privilege of reliving some other hapless hacker's late-night debugging sessions. Keith and Steven Brain are stars of this depressing genre. Their book covers the inevitable Eliza-style program, so painstakingly tweaked and tuned that the essential principles of syntax analysis disappear from view.

Then there's a so-called expert system which asks the same questions every time, and bears little relation to the way real expert systems work. The program is extended so it can learn by

example. The algorithm is the same one used by Hartnell. Pattern recognition is introduced with a program which works like the previous generation of machines for reading typewritten documents. There is no hint of the power and flexibility, let alone the limitations, of modern computer vision techniques.

One thing you will not find in many other books is the Soundex code, a phonetic shorthand that is useful for fuzzy matching when you have the rough pronunciation of a name but may not have the correct spelling. It's the kind of thing you might find useful some day, but like most of the Brains' book it does not have much to do with real AI. This is a pity. Some readers may form a false impression that AI is nothing more than a set of clever programming tricks.

What a relief to turn to Jones and Fairhurst's civilised book, spiced with genuinely witty cartoons and a quote from *The hitchhiker's guide to the galaxy* at each chapter head. The authors know their stuff, they can put it across, and they demonstrate that even in Basic you can program with style. The projects they suggest at the end of most chapters are big enough to be interesting, and small enough to have a good chance of success. This is real AI in miniature. You can build a mini expert system or, if you insist, run yet another Eliza clone.

The learning net — or perceptron — pattern recognition program is a miniature version of the Wisard system developed at Brunel University. The original hardware takes only five seconds to learn how to recognise an individual's face. The micro version can only handle much simpler images, but it does recognise, and it does learn.

Sadly Shiva has only put out a ZX Spectrum edition of Jones and Fairhurst's excellent book, so users of other machines ace the chore of Basic dialect conversion. Presumably the publisher wished to protect sales of Jeremy Vine's books, which are included in this review only because they have "artificial intelligence" in the title. They are really about text-based interactive programs. Shiva seems to have indulged in some

(continued on next page)

BOOK REVIEWS

(continued from previous page)

fairly cynical bandwagon-chasing here.

Even as a guide to the design of human/computer dialogues Vine's books are disappointing. They are really not much more than an introduction to the Basic keywords that are most useful in this kind of programming: string handling; On-Goto for menus; Print Tab for screen design; Get and Inkey for keyboard; Data, Read and Restore for the program's vocabulary. But the chapter on error trapping could be useful to budding programmers.

Mike James's thoughtful book *Artificial intelligence in Basic* introduces the subject rather neatly through a discussion of games and heuristics. The programs, in Microsoft Basic, are sensibly constructed from reusable subroutines. James's expert systems are a bit simple-minded, as usual. But there is some good stuff on ways of representing networks of relations between concepts. Believe me, in Basic it can be a bit of a performance. Perceptrons are discussed, but without a program listing. And James puts Eliza firmly in her place, offering only a small computer chat program which is kept simple so you can see how it works.

If you are seriously interested in expert systems, as distinct from other AI applications, Chris Naylor's *Build your own expert system* remains a very readable hands-on introduction. The Basic listings are for Apple II and Sinclair Spectrum, but conversion for other machines should present few problems. There is little or no use of sound and graphics, and if you are reading the book at all you are presumably not a complete novice at programming.

Naylor assumes you are in it for real. But you might think twice about using Basic for a serious application. And remember that the programming is the easy bit of building an expert system. Professionals often spend a year inter-

viewing an expert and refining his or her knowledge into a set of rules and procedures. The actual coding, into Lisp or Prolog or whatever, might take only a couple of weeks.

Advanced readers can easily spend hundreds of pounds on AI textbooks, most of which come from the U.S. One recent British paperback is good value for the serious student. Marc Eisenstadt and Tim O'Shea of the Open University have brought together some of the U.K.'s leading AI practitioners to write an anthology on tools, techniques and applications. It is up to date and practical, with Lisp, Prolog and Pop-11 examples, and copious references into the rest of the literature.

Expert systems, dismissed a little cruelly by Apple's Alan Kay as "the designer jeans of computer science", are indeed like jeans in one respect: some people have trouble getting into the subject. Help is at hand from numerous books. One of the best is by Jim Alty and Mike Coombs of Strathclyde University. It is brief, to the point, and instead of just cataloguing the famous expert

systems is says why they matter and what they did well.

Richard Forsyth and his nine co-authors have put together a readable management overview with a few more technical bits for the would-be programmer. Weiss and Kulikowski's *Practical guide* is thorough but a little colourless. The authors are amazingly self-effacing about their own pioneering work on deep causal models, which provides one possible answer to "What's the difference between an expert system and Gloria Vanderbilt?"

Ellis Horwood has added some new AI titles to their already strong list. *Progress in artificial intelligence* is a collection of papers from a 1982 European conference, featuring American stars like Roger Schank and Allen Newell alongside Europe's equally capable but less celebrated AI wizards. In another Ellis Horwood title, Richard Ennals of Imperial College makes an interesting case for the use of Prolog in teaching and research in the humanities. The multi-author symposium *Artificial intelligence: human effects* has its heart in the right place but the

big shock-horror book on the 1984-type aspects of AI has yet to be written. *Intelligent systems, the unprecedented opportunity* is a record of one of Sperry's fabled summer press seminars in the south of France. Top-rank speakers painted rosy pictures but dropped a few hints that a robotised paradise will not be attained with ease.

Machine intelligence and related topics is the uninspired title some saboteur has slapped on to a selection of Donald Michie's witty and ever relevant writings of three decades. Michie has seen a lot of the past and much of the future of AI.

Shirai and Tsujii's *Artificial intelligence: concepts, techniques and applications* was first published in Japanese in 1982 and is a re-export to the West of mainly western knowledge. Untrue to its title, it concentrates on techniques, at the expense of concepts and applications. Vision, for example, a field where Yoshiaki Shirai has made important contributions, is apparently dismissed in one paragraph. The people who actually know something about AI are so darned modest.

REAL AI

A practical guide to designing expert systems by Sholom M Weiss and Casimir A Kulikowski. Published by Chapman and Hall, 174 pages, £15. ISBN 0 412 26450 1

Artificial intelligence: applications to logical reasoning and historical research by Richard Ennals. Published by Ellis Horwood, 172 pages, £14.50. ISBN 0 85312 856 1

Artificial intelligence: concepts, techniques and applications by Yoshiaki Shirai and Jun-Ichi Tsujii. Published by John Wiley, 177 pages, £10.50. ISBN 0 471 90581 X

Artificial intelligence: human effects edited by Masoud Yazdani and Ajit Narayanan. Published by Ellis Horwood, 318 pages, hardback £22.50, paperback £12.50. ISBN 0 85312 577 5

Artificial intelligence in Basic by Mike James. Published by Newnes, 124 pages, £6.95. ISBN 0 408 01373 7

Artificial intelligence on the BBC and Electron by Keith and Steven Brain. Published by Sunshine, 134 pages, £6.95. ISBN 0 946408 36 X

Artificial intelligence on the Spectrum computer by Keith and Steven Brain. Published by Sunshine, 134 pages, £6.95. ISBN 0 946408 37 8

Artificial intelligence: tools, techniques and applications edited by Tim

O'Shea and Marc Eisenstadt. Published by Harper and Row, 497 pages, £12.95. ISBN 0 06 041894 X

Artificial intelligence: ZX Spectrum by Robin Jones and Michael Fairhurst. Published by Shiva, 158 pages, £5.95. ISBN 1 85014 026 X

Build your own expert system by Chris Naylor. Published by Sigma Technical Press, 249 pages, £6.95. ISBN 0 905104 41 2

Computer power and human reason by Joseph Weizenbaum. Published by Penguin Books, 287 pages, £2.95. ISBN 0 14 02 2535 8

Expert systems: concepts and examples by J L Alty and M J Coombs. Published by NCC Publications, 208 pages, £10.95. ISBN 0 85012 399 2

Expert systems: principles and case studies edited by Richard Forsyth. Published by Chapman and Hall, 231 pages, £9.95. ISBN 0 412 26280 0

Exploring artificial intelligence on your microcomputer by Tim Hartnell. Published by Interface Publications, 357 pages, £4.95. ISBN 0 947695 00 1

Exploring artificial intelligence on your BBC micro by Tim Hartnell. Published by Interface Publications, 292 pages, £6.95. ISBN 0 947695 01 X

Exploring artificial intelligence on your Commodore 64 by Tim

Hartnell. Published by Interface Publications, 292 pages, £6.95. ISBN 0 947695 02 8

Exploring artificial intelligence on your Sinclair QL by Tim Hartnell. Published by Interface Publications, 310 pages, £6.95. ISBN 0 947695 18 4

Exploring artificial intelligence on your Spectrum Plus and Spectrum by Tim Hartnell. Published by Interface Publications, 304 pages, £6.95. ISBN 0 947695 05 2

Intelligent systems: the unprecedented opportunity edited by J E Hayes and Donald Michie. Published by Ellis Horwood, 205 pages, £10.95. ISBN 0 85312 646 1

Machine intelligence and related topics by Donald Michie. Published by Gordon and Breach, 316 pages, £42.50. ISBN 0 677 05560 9

Progress in artificial intelligence edited by Luc Steels and J A Campbell. Published by Ellis Horwood, 320 pages, £28.50. ISBN 0 85312 830 8

On the road to artificial intelligence: Amstrad CPC-464 by Jeremy Vine. Published by Shiva, £5.95. ISBN 1 85014 064 2

On the road to artificial intelligence: BBC micro by Jeremy Vine. Published by Shiva, 102 pages, £5.95. ISBN 1 85014 045 6

ATARI

520ST

POWER WITHOUT THE PRICE

THE NEW ATARI 520ST

Under the new leadership of Jack Tramiel (former boss and founder of Commodore Business Machines), Atari Corporation have marked their entry into the world of business/personal computers with a machine which leaves the competition standing. Tramiel's slogan 'Power Without the Price' has been implemented in the manufacture of the new 512K Atari 520ST colour computer which offers the user amazingly high performance at an incredibly low price. Launched as a work-station, this new system incorporates seven software packages as well as the 520ST computer with 512K RAM, mouse controller, high resolution monochrome monitor (640x400), 95 key keyboard (with 16 key numeric keypad), MIDI interface, GEM and a 500K 3 1/2 inch disk drive. All for the package price of only £651.30 (+VAT = £749). Dubbed the 'Mac beater' and the 'Jackintosh' (after Atari's Chief, Jack Tramiel), Atari's new machine has been directly compared with the Apple Macintosh RRP £2595 (+VAT = £2985) which offers similar features and capabilities but at a much higher price. Favourably reviewed by the UK's highly critical specialist computer press, the 520ST is likely to make a great impact in this country as a sophisticated alternative to an IBM PC, APRICOT or APPLE MACINTOSH. Unlike its overpriced competitors, the Atari 520ST can be linked up to a colour monitor to unleash a choice of up to 512 colours. The addition of colour brings out the full potential of graphics packages such as GEM.

USER FRIENDLY GEM OPERATING SYSTEM

The power of the ST is harnessed and made user friendly by the new operating system 'GEM' from Digital Research. GEM stands for Graphics Environment Manager and allows a user friendly colour or B/W graphics interface which closely resembles that of the Macintosh. This similarity extends to the use of moveable resizable windows, icons to represent objects such as disks and disk drives, and the use of pull down menus and a mouse. The advantage of all this is that the computer becomes extremely easy to use. GEM has now been implemented for the Acorn, ACT, Atari, IBM, ICL, and Olivetti. Software written for GEM on one computer should also run under GEM on another computer. This will enable the market to quickly produce a large library of standard interchangeable software.

FREE SOFTWARE AND FUTURE EXPANSION

The Atari 520ST comes supplied with seven free software packages as listed below: 1) TOS - Tramiel Operating System based on CPM 68K. 2) GEM Graphics Environment Manager by Digital Research (DR) giving a WIMP (Window, Icon, Mouse, Pull down menu) environment. 3) DR GEM Paint for creating graphics masterpieces. 4) DR GEM Write for word processing. 5) Logo learning language to enable you to write your own programs easily using turtle graphics. 6) DR Personal Basic a powerful user friendly version of the Basic programming language. 7) BOS operating system giving you access to dozens of business applications packages already available on the market. Designed with future expansion in mind, the ST also features a host of different interfaces to the outside world and an impressive list of accessories is planned. Atari will soon be releasing a 1000K (1MB) 3 1/2 inch disk drive, and a 15MB hard disk storage system as well as a mass storage compact disc (CD) player capable of storing an entire 20 volume encyclopedia on one disk. A full range of inexpensive printers are planned including dot matrix, daisywheel and thermal colour printers. With its unbeatable graphics, speed and software at a price which is far below that of any comparable personal computer currently on the market, the ST is all set to do battle with the competition. To receive further details of the ST from Silica Shop, just fill in the coupon below with your name and address details and post it to us.

Silica Shop Price: £651.30 + £97.70 VAT = £749.00. This price includes:

- ★ 512K RAM
- ★ MOUSE
- ★ GEM
- ★ B/W MONITOR
- ★ 500K 3.5" DISK DRIVE
- ★ KEYBOARD (95 KEYS)



ATARI 520ST SPECIFICATION

MEMORY
Individually addressable 32K bit-mapped screen with 3 screen graphics modes
320x200 pixels in 16 colours (low resolution)
640x200 pixels in 4 colours (med resolution)
640x400 pixels in monochrome (high res)
16 shades of gray in low res mode
512 colours available in low/medium res
8 levels of each in red, green and blue

GRAPHICS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT52 Terminal Emulation Software
Maximum baud rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 2 button mouse)
MIDI interface for external music synthesizers

ARCHITECTURE
4 custom designed chips
GLUE Chip - MMU Memory Mgmt Unit
DMA Controller - Graphics Processing Unit
16.25 bit Motorola 68000 processor at 8MHz
eight 32 bit data registers
eight 32 bit address registers
18 bit data bus/24 bit address bus
7 levels of interrupts/56 instructions
14 addressing modes/5 data types

DATA STORAGE
High speed hard disk interface
Direct memory access - 1.33 Mbytes per second
CD (Compact Disc) Interface
Built in cartridge access
Dedicated floppy disk controller

DISK DRIVE
500K (unformatted) 5 1/4" floppy d/drive
349K (formatted) storage capacity

SOUND AND MUSIC
Sound Generator
Frequency control from 30Hz to above audible
3 voices (channels) in wave shaping sound in addition to a noise generator
Separate frequency and volume controls
Dynamic envelope controls
ADSR (Attack, Decay, Sustain, Release)
Noise generator
MIDI interface for external music synthesizers

KEYBOARD
Separate microprocessor
Standard QWERTY typewriter styling
Ergonomic angle and height
95 keys including 10 function keys
Numeric keypad - 16 keys including ENTER
One touch cursor control keypad

MONITOR
12" screen - high res monochrome monitor
640x400 monochrome resolution
Note: Some of the above specifications are pre-release and may therefore be subject to change

VIDEO PORTS
Display - Low Resolution - 40 columns
Med/High Res - 40/80 plus cols
Medium res RGB (Red/Green/Blue) output
High resolution monochrome (Black & White)

COMMUNICATIONS
Bidirectional centronics parallel interface for printers, or modems capable of input/output
RS232C serial modem/printer interface
VT52 Terminal Emulation Software
Maximum baud rate up to 19,200
High speed hard disk interface
Floppy disk controller (Western Digital)
2 joystick ports (one for 2 button mouse)
MIDI interface for external music synthesizers

GEM WIMP ENVIRONMENT
WIMP - Window Icon Mouse Pop-down menus
Two button mouse controller
Icons/Pull down menus/Windows
GEM VDI - Visual Device Interface
GEM AES - Application Environment Services
GEM BBT - Bit Block Transfer
Real time clock & calendar

SOFTWARE
GEM environment with user friendly Macintosh style operation
TOS - Tramiel Operating System
Atari's own system based on CP/M 68K with a hierarchical directory & file structure plus a host of MS DOS & UNIX command structures
BOS - Business Operating System to run any standard BOS business programs
GEM Desktop
with GEM PAINT graphics mgmt system and GEM WRITE word processor
Personal BASIC and DR Logo originally written by Digital Research (DR)
Very much like those on other machines except for the extensive use of pull down menus, mouse control and windows

VARIOUS
Dimensions 470mmx240mmx60mm
Replaceable external power supplies
Expansion: 2x floppy disk drives 500K/1,000K (two drives can be connected)
3 1/2" 15MB hard disk
CD (compact disc) drive
Dot matrix & daisywheel printers (black)
Thermal dot matrix (colour)
RGB & monochrome monitors

LANGUAGES
BASIC & LOGO supplied
Many others will soon be available, including Assembler, BCPL, C, Cobol, Compiled Basic Lisp, Modular-2 and Pascal

MACINTOSH v F1e v 520ST

"Imagine a Fat Mac - the 512K Apple Macintosh - but with a bigger screen, a far bigger keyboard with numeric keypad, colour and function keys, and colour. That gives you some idea of what the Atari 520ST is like, except for two important things. First the Atari seems faster. Second the Atari system is about one third the price!"
June 1985 - Jack Schofield - PRACTICAL COMPUTING

FEATURES OF BASIC SYSTEM	APPLE MACINTOSH	F1e	ATARI 520ST
Price includes B/W Monitor	YES	NO - extra £200	YES
Keyboard size mm (LxDxH)	330x147x50	450x167x28	470x240x60
Keyboard size ins (LxDxH)	13x5 7/8 x 2	17 1/2 x 6 1/2 x 1	18 1/2 x 9 1/2 x 2 1/2
3 1/2" D/Drive (Unformatted)	500K	500K	500K
3 1/2" D/Drive (Formatted)	399K	315K	349K
WIMP (Window, Icon, Mouse ...)	Apple	ACT - Activity	GEM
Real-time Clock	YES	YES	YES
Polyphonic Sound Generator	YES	NO	YES
RS232C Serial Port	YES	YES	YES
Centronics Parallel Printer Port	NO	YES	YES
Dedicated Floppy Disk Controller	NO	YES	YES
Hard Disk DMA Interface	NO	YES	YES
Full stroke keyboard	YES	YES	YES
Number of keys on keyboard	59	92	95
Numeric Keypad	NO	YES (16 Keys)	YES (16 keys)
Cursor Control Keypad	NO	YES	YES
Function keys	NO	10	10
16-bit processor	68000	Intel 8086	68000
Processor running speed	8MHz	4.77MHz	8MHz
RAM size	512K	256K	512K
Number of graphics modes	1	4	3
Number of colours	Monochrome	16	512
Max Screen Resolution (pixels)	512 x 342	640 x 256	640 x 400
Mouse Included	Single Button	NO - extra £95	Two Button
Replaceable External Power Pack	NO	NO	YES
Cartridge Socket	NO	NO	YES
Joystick Ports	NO	NO	YES (two)
MIDI Synthesiser Interface	NO	NO	YES
Monitor Size	9"	9" - extra £200	12"
RGB Video Output	NO	YES	YES
System Cost with: Mouse - Monochrome Monitor - 512K RAM - 500K Disk Drive			
Price of basic system (exc VAT)	£2595-VAT	£595-VAT	£652-VAT
+ mouse	Included	£95-VAT	Included
+ Monochrome Monitor	Included	£200-VAT	Included
+ Expansion to 512K RAM	Included	£295-VAT	Included
Price of complete system (exc VAT)	£2595-VAT	£1185-VAT	£652-VAT
PRICE rounded down including VAT	£2,984	£1,362	£749

"Atari's new corporate image as an aggressive low cost computer maker is likely to mirror that of Commodore where Tramiel established the maxim that 'Business is war'."
August 21st 1984 FINANCIAL TIMES
"This is the only personal computer I know of that comes with a MIDI interface as standard."
Peter Bright March 1985 PERSONAL COMPUTER WORLD
"The (GEM) version running on the Atari 68000 machines will have the additional advantage of leaving the PC version standing."
April 6th 1985 PERSONAL COMPUTER NEWS
"It would seem that GEM offers the ideal operating system."
March 17th 1985 POPULAR COMPUTING WEEKLY
"I found it (GEM) extremely easy to use and was very impressed with the way in which it disguises the unfriendly hardware and operating systems lurking under the surface."
Peter Bright Feb 1985 PERSONAL COMPUTER WORLD

PRESS COMMENT

"The electronics in the machine are a work of art... The heart of the 520ST is a Motorola 68000, one of the most powerful 16-bit processors around and in many respects it is close to being a 32-bit chip... when the machine appears in the shops, it'll be the front and of the queue to buy one."
Peter Bright June 1985 PERSONAL COMPUTER WORLD
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ATARI 520ST

WILL IT BE READY IN TIME?

Don't believe what you read in the comics: there's still plenty of work to be done on this machine before it's ready, but it may well be worth waiting for.

HOW IT WORKS

The Atari 520ST has a full Motorola MC-68000 chip which can directly address 16Mbyte of RAM, an MK-68901 multi-function peripheral chip, plus DMA and memory-controller chips. RAM can be by 16 64Kbit or 256Kbit or 1Mbit chips giving 128K or 512K or 2Mbyte of RAM respectively.

Screen RAM is part of main RAM and bit-mapped to the screen starting in the top left-hand corner. It is controlled by a Video Shift Register chip which shares access to RAM equally with the 68000. Colour registers, if used, contain three bits each for red, blue and green, giving eight levels of each colour and thus a 512-colour palette.

Two MC-6850 asynchronous communications interface adaptors control I/O to the keyboard, RS-232C serial, eight-bit Centronics and 16-channel Midi ports. A Western Digital WD-1770/2 acts as a floppy-disc controller.

Sound is provided by an AY-3-8910 sound generator or the equivalent Yamaha YM-2149 shown here. It offers three voices and a range from 30Hz to 125KHz. The voices are mixed and output via the TV or monitor speaker.



The 520ST layout is similar to that of the IBM PC, including the ill-placed Backslash key between the left Shift and Z.

This is not a review of the Atari 520ST, nor is it a preview, as published in our June issue page 55. Frankly, the 520ST is not yet in a fit state to be reviewed. However, the chance to borrow a software development system for use on our own premises was too good to miss. It also provided some pointers to the state the machine will be in when it is finally launched.

The software development system comprises an Atari 520ST with 512K of RAM, the SM-124 medium-resolution monochrome monitor, SF-354 3.5in. disc drive, two-button mouse and software, and photocopied documentation which formed a stack nearly 7in. high and weighed 14lb.

The software was on five 360K micro-floppy discs and included the TOS operating system, a language disc, and three developer's discs — a C compiler and assembler, a linker and a set of tools. There were two major disappointments. First, the languages disc contained only Logo and not Basic. Second, no word processor was supplied. As all PC's standard Benchmarks require Basic, it was not possible to produce any comparative figures.

Atari is currently selling the kit to software houses for £1,200, and has parted with about 130 — obviously we have not seen the cheques. It is not unusual for software houses to get free machines. The idea of selling them for a premium is both to bring demand closer to supply, and to encourage software houses to actually work at producing software to recoup their investment. Information — not from Atari — suggests that Metacomco, Psion, Precision Software, Triptych, Hi-Soft, Hewson, Beyond, Melbourne House, Adventure International, Silicon Chip and BOS are among the software houses with outfits. There must be many others in the U.S. Amsoft has a kit too, but I doubt whether Amsoft is actually writing software. All this is the foundation for Atari's hope of having 50 programs ready by launch date.

CHEAP OPTIONS

The system was delivered in unopened boxes, and turned out to be a wonderland of Far Eastern manufacture. The keyboard console came from Korea, the monitor from Taiwan, the disc drive from Japan and the power supplies from Singapore. Presumably someone in the U.K. just makes up a set then ships them out of the door. While this may sound an odd way to put together a system, it does start to account for the low price.

Assembling the system is a pain. First, you have to find three three-pin mains plugs — one each for the two separate transformers that power the disc and console, and one for the 240V monitor. Connect the monitor and disc drive to the console with two more cables, plug in the mouse and the result is a lot of unsightly wire.

Neither did it work first time. The operating system is on disc, and I had the drive cable plugged into the Out socket instead of In. As with eight-bit Atari micros, the discs can be daisy-chained, so Out is

there for adding a second drive, and once it was corrected the system worked.

The Atari 520ST has been described as a Jackintosh, meaning Jack Tramiel's version of the Apple micro. There are certainly strong similarities in the way they work, with icons, windows, pull-down menus and mouse pointing. In other respects the two machines are very different, particularly in the keyboard design.

MICE FOR EXECUTIVES

The Macintosh has a very small keyboard, the idea being to switch attention to the mouse for keyboard-shy executives. The Atari 520ST keyboard is huge. Of course, the Atari motherboard is inside the keyboard, whereas in the Macintosh it is packed in with the monitor. The 520ST keyboard is the same in colour, touch, finish and approximate cross-section as the Atari 130XE, so examining one of these provides a fair idea of what the 520ST is really like.

The 520ST key layout is very good. It is similar to the IBM PC but with a huge Return key, and the 10 function keys along the top instead of down the side. On the far right is an 18-key numeric pad with large 0 and Enter keys. Between them is a neat cursor-control block which includes Help, Undo, Insert and Clr Home keys.

The console has a 128K cartridge slot on the left, plus joystick and mouse ports on the right. Both the monitor and disc drive match the console for styling. The monitor looks very smart and produces a very sharp, stable image. It is much bigger than the Macintosh screen — 12in. against 9in. The disc drives seem rather simply constructed, but at least there is an eject button.

Both monitor and disc drive link into the console via DIN plugs — a 13-pin for the monitor, and a 14-pin for the disc. Two further DIN sockets provide Musical Instruments Digital Interface (Midi) in and out. Three standard D-connectors provide an RS-232C serial port, two-way Centronics printer port and hard-disc interface. The last-named is a direct memory access (DMA) interface, but the hard-disc controller will still be built into the drive itself. The hard-disc port is also used for the CD-ROM Atari showed at a recent exhibition. This is a read-only 500Mbyte video disc.

Inside the case the main board is clean and beautifully laid out. The hardware looks finished, except for the ROM-based software. There remains a considerable amount of work to be done on that.

The 520ST has attracted attention for its spectacular hardware specification, but it also comes bundled with a high-value selection of software. Most of this comes from Digital Research, being the Gem graphics environment, Gem Write, Gem Paint, Personal Basic and DR Logo. Some of these programs are already familiar in versions for the IBM PC and other micros. Gem Write is reportedly based on the popular word processor Volkswriter. All these operate under the umbrella of the Tramiel Operating System (TOS), which has CP/M-68K at its heart.

The last piece of bundled software is BOS, the micro-Cobol Business Operating System, written in the U.K. This should provide rapid access to a range of business software, but presumably without the mouse operation and pull-down menus.

It is intended that TOS, including Gem Desktop, will be implemented in six 32K ROMs. At the moment it is still loaded from disc, while the software writers continue to debug it and reduce it in size. As used, it comprised 280K of code, taking about 30 seconds to boot. This is a long way from the 192K of ROM space.

Gem on the Atari 520ST looks and works like Gem on the IBM PC, as reviewed in our August issue, page 50, except that the display is better. The monochrome display, with its characters built on a 16-by-16 matrix, looks better than the Mac. However, the colour mode offers a lower-resolution character set of eight by 16 pixels, and a much less readable text.

MAC-STYLE WINDOWS


Of the bundled software, only TOS and DR Logo were supplied. The latter takes its style from the Macintosh. Different windows can be set to hold different things on-screen at the same time, including a graphics area and a debugging window.

The Atari version is a superset of the IBM PC version of DR Logo, unlike the Amstrad one which is cut down. Extra features of the Atari DR Logo include primitives for Arc, Box, Circle, Ellipse and Poly for graphics, Sort in the list processing, plus zoom, line and fill attributes.

DR Logo worked well when everything went right, but had a very strong propensity to crash. Except for the trapping of primitives, error trapping was wholly inadequate, but presumably this will be sorted out before the machine is launched.

The 520ST is not yet in a fit state to have its performance measured. It seems rather quicker than either a 512K Macintosh or the IBM PC running Gem. There is no feeling of drag to the mouse-pointer's movements. However, where Wimps machines start to slow is when handling lots of data in large programs, and the 520ST cannot yet be put under the same kind of load.

First impressions of the performance remain good. However, the whole system is still about as bug-ridden as the Sinclair QL and Quill were when they were released. It is to be hoped that Atari learns from Sinclair's mistakes, and does not release the 520ST in this form.

At the time of writing there were less than two months to the September launch, and there looked to be more than two months' work to do. Therefore, it may be that the first sale machines, with TOS and Gem on disc instead of in ROM, will not be a wise buy for people who are not either hackers or software writers. *Practical Computing* will return to the Atari 520ST when it is finished enough to be, in Atari's opinion, shippable, even if this is not its ultimate form. Until then, just do not believe what you read in the comics. 

FERRANTI PC-860

A SUBSTANTIAL ADVANCE

By John and Timothy Lee

The Advance 86 has been tidied up to make a cheap, fully IBM-compatible system.

The announcement of two more IBM PC look-alikes, the Ferranti PC-860 and the Ferranti PC-860XT models, caused only minor ripples of excitement in a market already overcrowded with products. In most respects these new machines are simply a re-packaged version of the earlier Advance 86B machine, but they probably offer the best chance for the British microcomputer industry to fight the domination of IBM.

The Ferranti machines are solid and reliable. They are made in the U.K., rather than the Far East, by a firm trusted to make defence equipment. Ferranti has a strong commitment to customer support, which is important. Probably half the makers of personal computers will cease to trade in the next three years, but Ferranti is a firm which is here to stay.

Like a bride, the Ferranti machines have "something old and something new, something borrowed and something blue". The old part is the established board structure and power supply, and operating system from the Advance 86B, which was also made by Ferranti. The new features are the case, keyboard, optional hard disc, optional colour monitor, a new version of Basic, support for Concurrent CP/M and the 8087 arithmetic co-processor, and new improved versions of bundled software. The borrowed and blue parts both relate to Big Blue, as IBM is sometimes known. The Ferranti borrows IBM's software base by offering compatibility with the PC — but it runs faster and costs half the price.

One of the least attractive features of the Advance 86B has been the pair of large, ugly black plastic boxes in which it is housed. They seem a bit on the fragile side, and you would hesitate to stand a monitor on them. The Ferranti has a much smaller and better-looking metal case; it is cream-coloured like the IBM, and it has a robust appearance. It is strong enough to stand a monitor. The 860 has the same footprint as the Advance.

The new Ferranti keyboard is made by Keytronics. It is detachable, and similar in size and other respects to the IBM PC keyboard. There are 84 keys — one more than the IBM — in the standard QWERTY layout, with 10 function keys and a numeric/cursor pad. The extra key is a double-sized Return key for the numeric keypad, which occupies the space of the treble-sized + key on the IBM. Though the

Ferranti's keyboard is made of plastic, like that supplied with the Advance, it looks better quality.

The keyboard is connected to the front of the computer by a five-pin DIN plug and a 20in. coiled telephone-type cable. The IBM uses the same plug, but fits it into the back of the computer. The feel of the new keyboard is pleasant, with a soft but positive movement. The legs can be set at several heights, to tilt the keyboard at different angles. The Num Lock and Caps Lock keys now have status lights built-in.

The Return key is now double sized but in the left-to-right direction, as favoured by the Selectric's designers. Both Shift keys are slightly larger than the ordinary keys, and the left Shift key has been moved so that the two Shift keys are either side of the lower row of letters. As non-touch typists, we welcome the labelling of keys with words rather than the cryptic use of arrows — for example on the Return, Shift, Backspace and Tab keys. The keys are labelled with the English layout



Ribbon cables join the expansion board . . .



SPECIFICATION

CPU: 8086 running at 4.77MHz;

provision for 8087 maths co-processor

RAM: 256K as standard, expandable to 640K; 16K screen memory

Dimensions: 520mm. (20.5in.) × 410mm. (16.3in.) × 170mm. (6.75in.)

Keyboard: 84-key detachable, made by Keytronics

Mass storage: two 360K floppies; single floppy plus 10Mbyte hard disc on XT model

VDU: option of monochrome or colour monitor

Display: Colour and graphics capability supplied as standard; maximum resolution 640 by 200 pixels

Software in price: MS-DOS, GWBasic, Perfect Writer, Perfect Speller, Perfect Filer

Price: PC-860 £1,250 plus VAT; PC-860XT £2,150; colour monitor £324; monochrome monitor £99

Manufacturer: Ferranti Computer Systems Ltd, Derker Street, Oldham, Lancashire OL1 3XF. Telephone: 061-624 9552

Distribution: available now, 12 months free now; on-site service included in price

of " £ @ and #, but it is necessary to run a program called Keybuk to configure it correctly. This is best done automatically as part of an Autoexec.Bat startup sequence.

The Ferranti PC-860 has two half-height Shugart SA-455 5.25in. floppy-disc drives, storing 360K each. On the PC-860XT one of the floppy drives is replaced by a Seagate hard disc with a formatted storage of 10Mbyte. It is supposed to withstand a shock of 40G: we did not test this claim, but

BASIC BENCHMARKS

The standard Basic Benchmarks — see *Practical Computing*, January 1984 page 104 were run on the PC-860XT and on three comparable machines. The timings below are in seconds.

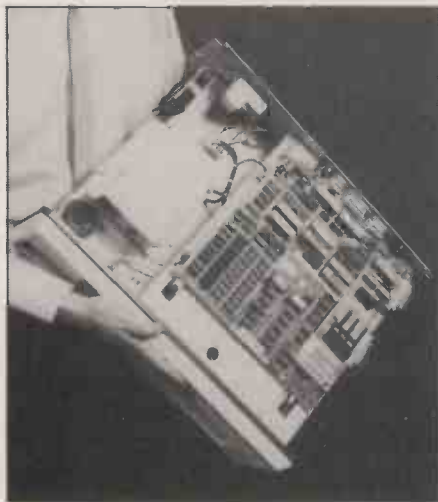
	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Ferranti PC-860 — 8086	0.8	3.5	7.9	8.1	8.8	16.0	25.6	28.3	12.4
Olivetti M-24 — 8086	0.5	2.0	4.6	4.7	5.2	9.4	14.8	16.1	7.2
Canon A-200 — 8086	0.9	3.4	7.4	7.6	8.3	14.8	23.5	25.6	11.4
IBM PC — 8088	1.2	4.8	11.7	12.2	13.4	23.3	37.4	30.0	16.8

moving the computer while the hard disc was on had no ill-effect. The hard-disc controller board occupies one of the IBM-compatible slots, and includes an 8085 processor.

In choosing between the 860 and the 860XT the increased price and the increased noise from the hard-disc motor must be set against the greatly increased storage capacity and faster access to disc files. The noise is significant, but not too intrusive. The XT machine boots from the floppy disc if one is present and the drive door closed, otherwise it boots from the hard disc.

The Ferranti PC-860 has colour capability built-in, and requires a medium-resolution colour-graphics monitor to make the most of its 640- by 200-pixel graphics resolution. This is the same as the Advance and IBM. A plug at the back of the computer gives RGB output through a nine-pin D connector. Ferranti now sells a badge-engineered Microvitec 1456 monitor styled to match the system box. It has an illuminated power switch at the front; brightness and contrast controls are also at the front, but neatly hidden behind a hinged cover. The screen is made of matt non-reflective glass, and looks slightly better than the IBM colour monitor. This is partly because of the absence of reflections, and partly because the screen is about an inch larger in all directions. The display is exceptionally sharp, and coloured characters do not look like three letters in primary colours displaced relative to each other. A monochrome monitor is also available.

The screen display is stable. Most of the IBM clones suffer from a flicker during scrolling and with many programs or MS-DOS this happens every time you press Return. The flicker is caused by blanking the



... to the motherboard under the PC-860.

FERRANTI PC-860				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

The Ferranti is an advance on the Advance. Though still something of an ugly duckling, it offers excellent value for money.

screen during scrolling to eliminate snow; it is much less pronounced on the Ferranti than on the Advance, possibly because scrolling the screen takes longer. A simple For-Next loop that prints the counting variable 100 times took 5.2 seconds to run on the IBM PC, 8.4 seconds on the Advance and 20.2 seconds on the Ferranti. By contrast, screen updating that does not involve scrolling is faster on the Ferranti than on the IBM, presumably due to the faster processor chip.

The Ferranti runs GWBasic, as opposed to the Basic used on the IBM and the Advance; however, they are virtually the same product from Microsoft. The Ferranti implementation sensibly defaults to an 80-column screen both on entering Basic and on returning to the system. The Advance implementation annoyingly had both defaults set to 40 columns.

GWBasic supports colour and graphics, but still cannot utilise all the available memory. For example, on a standard machine with 256K of memory, the operating system occupies one bank of 64K, the Basic interpreter occupies another 64K bank and the user's program may use nearly 64K, leaving 64K unused. With 640K of RAM installed, 448K, remains inaccessible to Basic.

Another new feature is support for the Concurrent CP/M operating system, and the 8087 arithmetic co-processor. The Advance 86B does not run Concurrent CP/M because the vectored interrupts do not work; this also stops the 8087 from working, even though there is a socket for it. Ferranti has added a small extra board inside to rectify this, so the new machine runs both Concurrent CP/M and an 8087 chip. If your particular type of work is processor bound, with long slow arithmetic calculations, then the extra £199 you have to pay for the 8087 is likely to be a worthwhile investment.

New and improved versions of the Perfect

2 suite of word processor, spelling checker and spreadsheet/filing system are included, rather than the original Perfect software bundled with the Advance. The new word processor is of the WYSIWYG (what you see is what you get) type, which was not the case with the earlier version; it was reviewed in *Practical Computing* last June.

Inside the Ferranti's metal case there is the old Advance A mother board mounted upside down — that is, with the chips downwards. The board has 256K of RAM, and a number of ULAs, all with massive heat sinks to prevent overheating. The original 8086 socket now contains a piggyback board, which in turn has the 8086 in it, and an empty socket for the 8087 arithmetic co-processor chip should you want one.


The old Advance B expansion unit is mounted the right way up. It provides four IBM expansion slots, and two 16-bit expansion slots. On the PC-860, the disc controller board occupies one IBM slot, and on the PC-860XT a further slot is taken by the hard-disc controller, leaving only two empty slots for extra IBM cards. This is not a problem since the basic machine has both serial and parallel ports, and the graphics board is built-in, not plugged in as an extra board as on the IBM.

We tried the Magic Memories and Qubie multi-function boards, in the expansion slots, and on both we were able to read and set the clock, and install extra memory without difficulty. If this memory is used as a RAM disc, care must be taken to avoid conflict between the RAM disc and the hard disc both thinking they are drive C. The Magic Memories software automatically makes the RAM disc drive D if there is a hard disc but the Qubie software requires you to choose the right option.

There are two power supplies, and two disc drives. It is good to see that a cooling fan is now an integral part of the case, since the Advance 86B had a problem with overheating. The metal case and fan kept the machine running faultlessly in our tests, even though it was in direct sunlight on the hottest day of the year. The cassette interface from the Advance 86A has been discarded.

CONCLUSIONS

■ The Ferranti PC-860 has a full specification, lacking mainly a hardware reset and built-in clock/calendar cards. The inclusion of colour graphics, ports, MS-DOS, GWBasic, Perfect 2 software, and a year's on-site service make it excellent value for money.

■ While the interior layout is a bit messy, this is only to be expected considering the design's origins in the expandable Advance 86A and 86B. But the exterior appearance and keyboard are much improved. 

BAGSHAW BENCHMARKS

The standard disc Benchmarks — see July issue, page 99 — were run on the hard-disc version of the Ferranti and on two other 10Mbyte hard-disc machines. All timings are in seconds.

	BM0	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	BM9	BM10	BM11	BM12	BM13	TOTAL
Ferranti PC-860XT	17.6	4.0	7.7	4.3	2.2	13.4	4.6	19.1	4.4	2.3	4.2	63.8	26.6	20.0	194.7
IBM PC/XT	19	5	19	15	3	22	8	27	8	3	3	76	31	15	254
Olivetti M-24	9.8	3.9	4.0	5.0	3.1	18.3	1.6	19.0	2.0	1.9	3.0	19.5	15.4	13.0	119.5

PENMAN PLOTTING ROBOT

By Ian Stobie

It may look like a slightly comical toy, but it performs as a cheap and effective plotter.

Penman is a low-cost three-pen plotter based on a very original design concept. It is more like a turtle than a conventional x-y plotter; it moves around on wheels on top of the piece of paper, drawing as it goes. Surprisingly, it plots quite well.

Penman costs £249 plus VAT in its basic form. It was developed by Penman Products of Worthing in Sussex as a serious low-cost plotter for business use, although it has obvious potential as an executive toy. The company sells Penman bundled with graphics software for the IBM PC, Apple II, Macintosh and BBC machines, and also in an unbundled form for other systems equipped with an RS-232 interface. We had a look at the Macintosh offering, which costs £299 including a special version of Microspot's Macplot program set up to drive Penman but not other plotters.

Physically Penman consists of two parts; a control box containing the electronics and a 5in. square robot which actually does the drawing. The two are connected together by a metre of lightweight ribbon cable. When not in use the robot slots neatly into the control box to form a single, easily stored unit 13in. long by 5in. wide.

Underneath the robot are the wheels that propel it around the paper. There are two drive wheels plus a third free-swivelling castor arranged in a triangle. Three pen holders are ranged along the front of the robot. These take standard Hewlett-Packard plotting pens, and will also accept ordinary Pentel pen refills. The pens are automatically raised and lowered as required during plotting to change the drawing colour.

Setting up Penman is straight forward. You connect the RS-232 port on the back of the Penman control box to the appropriate port on your computer. With the Macintosh you can use your existing Imagewriter printer cable.

To get good results with Penman you need to put the paper on a flat, black, level surface. We were supplied with a large sheet of black Perspex, which costs an extra £17.50. This forms a very satisfactory plotting base, as the paper sticks to it electrostatically. Penman orientates itself by

looking for the edge of the paper, using two light receptors underneath the plotting robot next to the driving wheels. This restricts you to using light-coloured paper, otherwise the plotting robot gets lost.

Penman will plot on any size of paper up to about 17in. by 12in. This limitation is imposed by the length of the cable between the plotting robot and the control box. Conventional low-cost plotters are generally restricted to using A4 paper, less than half the size.

We expected problems plotting on overhead transparency acetate, thinking the drive wheels might slip. They did not, but they left faint tracks on the film which might

PENMAN				
K ^H VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Although Penman is a triumph of design, conventional plotters are quicker and more convenient.

show up on some projectors. You also need to change to quick-drying pens.

To plot accurately Penman needs a point of reference, and it uses the bottom left-hand corner of the paper for this. You start a plot by placing the robot near this home position with its pens facing outward. The robot first propels itself forward to the paper's left edge, jiggling about until it is exactly parallel with it. It then rotates 90° and looks for the bottom edge, before finally motoring towards the middle of the paper to start plotting.

Periodically the robot will stop plotting

and return home to check its alignment before continuing. These checks are necessary to prevent positional errors building up because between trips home Penman is operating purely by dead reckoning.

Opening the Penman body up reveals striped discs around the shafts of both drive wheels. The Penman employs ordinary d.c. motors, but uses them as part of a classic feedback loop with the controller. The stripes are read optically to measure the actual wheel movement, and this information is fed back to the eight-bit Hitachi 6303 processor in Penman's control box. This works out the wheel movements needed to get the robot to its current goal and transmits the necessary command signals to the motors.

This system is more accurate than the approach used in most school-type turtles, where the controller simply sends one-way orders to stepper motors. If, for instance, the Penman robot hits a small obstacle on the paper the wheel discs will be out of position, and this can be corrected in the next control movement.

Penman is good at drawing smooth curves, which on cheap plotters of a conventional design often have a saw-toothed stepped look to them. It is fascinating to watch it drawing straight lines, as it seems to be able to do so while facing in almost any direction.

The Mac version of Penman works best with packages like Macdraw and Macproject, which use the Mac's Quickdraw vector graphics format. Many other Mac packages use the Macpaint format, which represents pictures internally as a matrix of dots rather than lines. You can just about use Penman to output such images, but a matrix printer will do it better and far more quickly.

The real problem with Penman is that it is not very quick compared to a conventional plotter when doing straightforward plotting

OTHER PLOTTERS

Conventional plotters have fallen substantially in price and the Penman has to be compared to these. One of the cheapest is Linear Graphics' Plotmate, a single-pen A4 plotter costing £299. This is sold mainly to BBC computer owners but also connects to other machines. Compared to such a machine the Penman offers the choice of three pens and the ability to plot on larger paper, but it is much slower.

A more typical business plotter is Epson's HI-80. It also takes A4 paper but has four pens and is generally faster; it costs £460. This is still cheap for a plotter — the industry-standard A4 machine is the Hewlett-Packard 7475A, which costs just over £2,000.



SPECIFICATION

Description: three-pen A3 plotter using self-propelled robot plotting mechanism

Manufacturer: Penman Products Ltd, made in U.K.

Price: £299 plus VAT for Macintosh version including Macplot, £385 for IBM PC with Penplot software, £299 for BBC with Micad and £314 for Apple II with Bitstick driver; Penman itself costs £249 plus VAT and is equipped with RS-232C interface

Supplier: Penman Products Ltd, 8 Hazelwood Close, Dominion Way, Worthing, West Sussex BN14 8NP. Telephone: (0903) 209081. Available now

SUPPLIERS

Epson Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892.

Hewlett-Packard Miller House, The Ring, Bracknell, Berkshire RG12 1XN. Telephone: (0344) 424898.

Linear Graphics 28 Purdeys Way, Rochford, Essex SS4 1NE. Telephone: (0702) 541665.

tasks. Doing a fairly simple pie chart taken from Jazz took us seven minutes when the plotted image area measured 6in. by 3in., and 28 minutes when it was expanded to 12in. by 6in.


Penman can be controlled directly from a programming language such as Basic or Logo. The Penman manual documents a complete command set, which you can send to the plotter embedded in Basic Print statements. These commands let you make absolute and relative moves, and specify arcs and circles using polar co-ordinates.

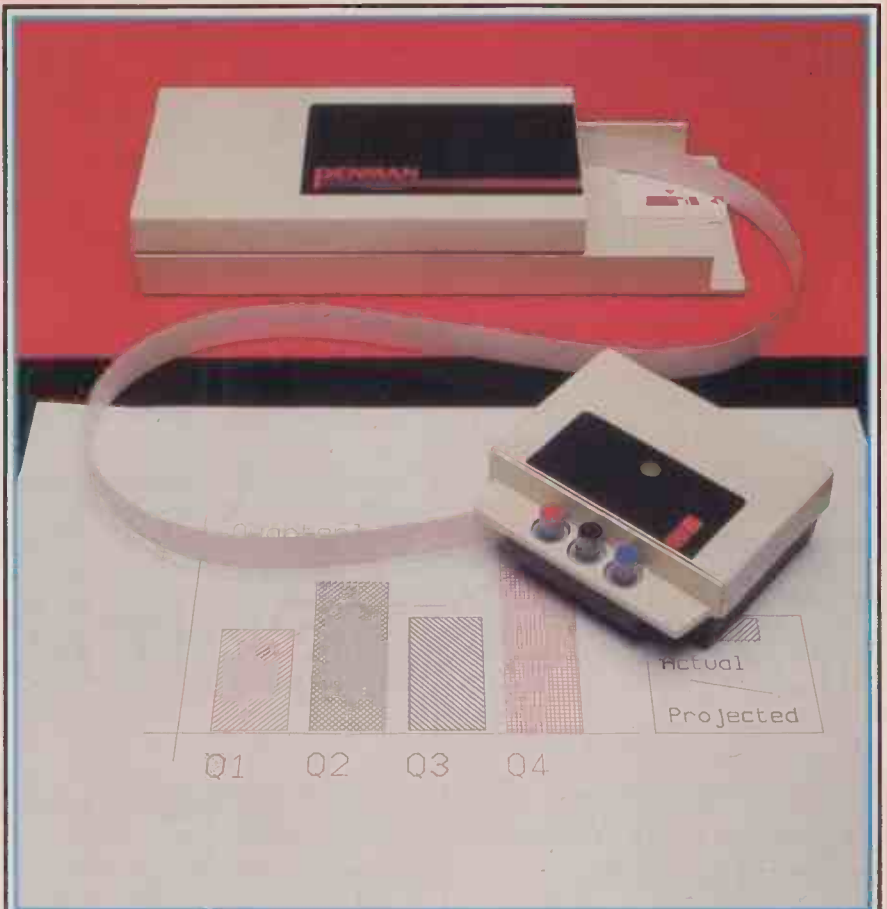
Traditional Logo turtles always face in the direction they are moving. You can make Penman behave in this way too, as the robot is equipped with a fourth pen holder mounted halfway between the two drive wheels.

CONCLUSIONS

■ At under £300 Penman is a very cheap plotter. It owes this low cost to its highly original design and good construction. The engineering is excellent.

■ The ability to plot on large A3-size sheets of paper is an advantage of the Penman approach. Plot quality is surprisingly good, almost up to conventional plotter standards.

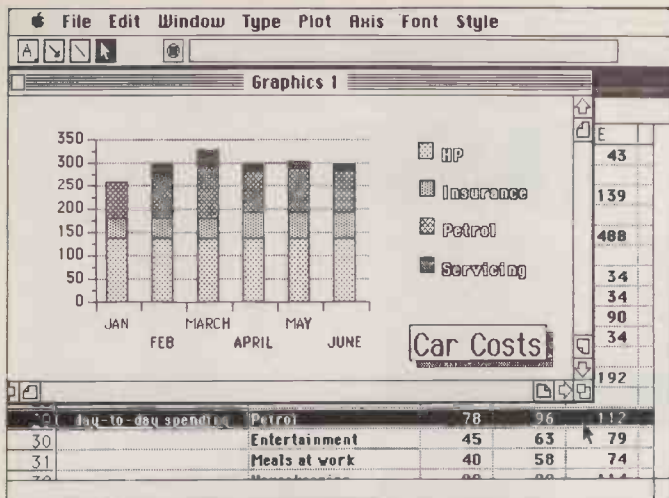
■ The penalty you pay with Penman is having to wait; plotting takes a long time. 



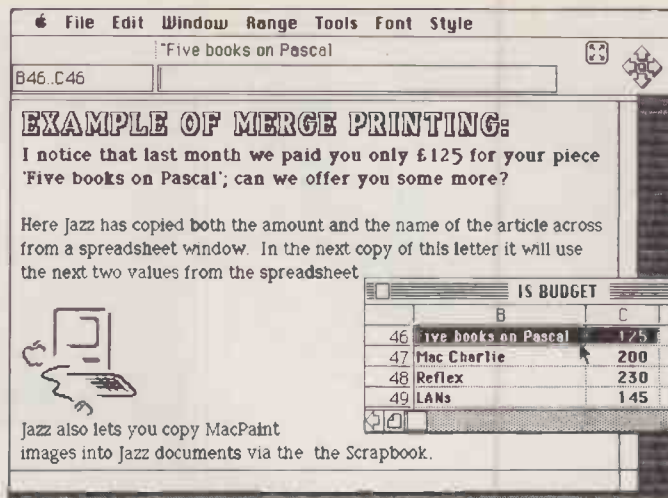
Because of its unusual geometry the Penman's body executes a curve even when drawing a straight line. The white slits are the paper edge detectors.



It took seven minutes to plot this figure — shown 80 percent of actual size.



The bar chart is based on data taken from the spreadsheet window.



Jazz's word processor can incorporate data from other applications.

LOTUS JAZZ HEAVY BUSINESS FOR THE MAC

By Ian Stobie

Widely touted as the program to bring business credibility to the Mac, Lotus's all-in-one package takes up where 1-2-3 left off.

Up to now, so the story goes, the Macintosh has lacked credibility when measured against the IBM PC because you cannot run heavyweight integrated packages like Lotus 1-2-3 on it. Now Lotus Development Corporation has finally brought out a similar do-everything package for the Mac.

Jazz is an all-new program, written especially for the Mac and different to both Lotus 1-2-3 and the company's other IBM product, Symphony. Like Symphony, Jazz handles all five of the most common business tasks: spreadsheet, word processing, business graphics, database and communications.

Jazz is undeniably both big and expensive. It costs £495 plus VAT, and in order to run it needs the full size 512K Mac and an external disc drive. The Jazz program is 405K long, so it fills one entire disc. At any time about 256K of it will be resident in the Mac's RAM, leaving about the same amount free for workspace. There is no room on the program disc for the Mac operating system, so you have to keep the relevant files on your data discs, taking up about half the usable space.

It is probably because Jazz is already a tight fit that the program does not offer any on-screen help facilities. By way of compensation Lotus provide a massive documentation set. The three main items are: a primer, pitched at a very elementary level and linked

to a set of lessons supplied on a separate disc; a prop-up quick reference guide and a 350-page handbook. The handbook is excellent, well illustrated and well indexed and with a glossary which doubles as an icon index.

You start Jazz by selecting one of the icons representing the various different functions. The spreadsheet is probably the place to start exploring Jazz, as it was the power of the spreadsheet in 1-2-3 which won Lotus its reputation. Everything works in a reassuringly Macintosh-like way. You navigate around the sheet by clicking with the Mac mouse on a set of arrows at the top of the screen, or simply by bumping the pointer into the side of the window in the direction you want to go. Clicking on a cell brings the contents into an editing box at the top of the screen. The editing commands are generally consistent with Macwrite.

In typical Mac fashion you can alter the appearance of the data in your spreadsheet by selecting different type fonts, styles and sizes from the pull-down menus at the top of the screen. You can have characters up to ½ in. high, but you can't mix up different

sizes and styles in the same spreadsheet, so you can't underline or embolden just a sub-total, for instance. Column width is adjusted in a neat way: you just point to the top of the column and tug the dividing borderline to its new position; everything then reformats automatically on-screen as you watch.

Jazz offers a maximum theoretical workspace size of 256 columns by 8,192 rows. This figure might appear to allow the most complicated model to be run, but it is purely theoretical: you also need to have the memory available to support your model. We got the message "There isn't enough memory to complete the operation" repeatedly when trying to centre text in particular columns of a fairly straightforward 15- by 40-cell cash-flow model. This is not a catastrophic fault, but it does mean that Jazz does not leave enough memory free on the 512K Mac to support some of its pretensions.

When it comes to printing out your model Jazz offers a very good range of options. You can print the spreadsheet sideways down the paper, so you do not have to worry about limitations imposed by your printer's width, and you can produce output reduced to 25 percent of its normal size. This is not wonderfully readable, but it is very handy for a quick preview of how things are going. You can incorporate the current date and time easily on any output.

The Jazz graphics function also provides a good range of choice. Its 11 chart types include all the normal business ones — pie, pie with exploded wedge, bar, stacked bar, percent stack bar, area, percent area, etc.

The procedure to construct a graph can get a little tiresome, with lots of switching between different windows. From the spreadsheet, for instance, you first open a new graphics window and then select the

LOTUS JAZZ

VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Jazz excels as a super-spreadsheet with great graphics but most people could manage just as well with something simpler and cheaper.

graph type. Every time you want to alter the graph you have to activate the spreadsheet window to type in a new value or indicate a different range to plot, and then return to the graphics window.

Jazz's main database display looks similar to a spreadsheet, with each cell in the grid now containing a field value. A record appears as a single row of cells, with several records fitting down the screen. You can have up to 100 fields, scrolling sideways across the screen to see them; according to the manual there is scope for several thousand records.

You can work directly on this spreadsheet-like display, but Jazz also allows you to define a record form. This is more convenient when you just want to see one record at a time, as when you are typing in a whole batch of records or querying the database, for example.

The Jazz database is not relational or capable of integrating one file to another. Each new record type you create defines a separate file. But having created a file you can do several useful things with it, including sorting it, searching it for records meeting specific criteria, then perhaps graphing information extracted from it or merging information into Jazz word-processing documents.

This is all very wonderful, but we did induce the system to crash in a spectacular way when cutting a field from a database form. We had Release 1 of Jazz to review, not a pre-production version, so the program should have been bug-free. What we were doing was perfectly legitimate — and even if it wasn't, the most Jazz should have done is display an appropriate warning instead of bombing out totally, with flashing screen and alarming sound effects.

Probably the most complex part of Jazz is the report generator for the database. This is intended for producing printed reports, and it departs a little from the "what you see is what you get" approach of the rest of the package, as it requires you to define the report without seeing its appearance on-screen.

Although the spreadsheet is probably the greatest glory of Jazz, the word processor is where most of the integration is done. The Jazz word processor seems pretty well exactly the same as Macwrite. There are some minor cosmetic changes — the formatting rulers are narrower, and spacing and justification information is displayed at the top of the screen — and it also seems to be a good deal slower, especially when cutting large blocks of text.

The justification for the Jazz word processor is the Hotview function. Of course, the ordinary Macintosh Cut, Copy and Paste functions exist in Jazz and let you transfer static views of data between the different applications. You can take some figures from the database, for instance, or a graph, and copy them into a report.

Hotview lets you do the same thing, but with the crucial difference that the data you include in the report will be updated whenever you alter it in the original. So, for

SPECIFICATION

Description: all-in-one software package aimed at business users
Hardware required: 512K Mac with external disc drive; optional modem
Spreadsheet: 8,192 rows by 256 columns, multiple worksheets on-screen, statistical and financial functions
Graphics: bar, pie, line, area, scatter and percent charts, Mac fonts
Database: user-designed record formats, on-screen queries, sorting, report generator; not relational — works with discrete files
Word processing: similar to Macwrite but with mail-merging; Hotview lets you incorporate current spreadsheet, database or graphic data
Communications: supports import of data directly into spreadsheet, word processor or database; emulates VT-52 and VT-100 terminals for mainframe link; converts 1-2-3, Symphony and Syllk files
Publisher: Lotus Development Corporation of Cambridge, Massachusetts
Price: £495 plus VAT
U.K. supplier: Lotus Development (U.K.) Ltd, Consort House, Victoria Street, Windsor, Berkshire SL4 1EX
 Telephone: (0753) 840281. Available now

instance, a graph you include in a report based on spreadsheet data will change when you change the spreadsheet. When you are working on a document which includes a Hotview, Jazz will automatically load in any documents it depends on to pick up the latest data.

The procedure to include a Hotview in a document in the first place is very simple. You first select the data, graph or whatever it is that you want to move. You then bring up your word-processing window and click the cursor at your intended destination. Finally you select Include from the Hotview menu at the top of the screen.

Hotview can also be used to produce form letters. The Merge Print option will print multiple copies of the same document, each one altered slightly to include different values taken from different cells in a spreadsheet or records in a database. In this way Jazz provides a very powerful and easy-to-use mail-merge function.

The Jazz word processor is not able to use existing Macwrite documents directly, but you can transfer them into the package via the Mac's clipboard. I wrote most of this review using Macwrite, and then transferred it to Jazz to finish it off. This involved lots of disc changes, and I lost some formatting information as the process ignores rulers and page breaks, but it did work.

Jazz also provides other ways of communicating with the outside world. The Comm application is for when you want to use a modem or a direct serial link to another computer. The appropriate Jazz menu says it supports both Apple and Hayes modems, but we did not have time to try it for this review. One advantage of using Jazz's Comm function is that it lets you download ASCII text directly into a Jazz database, spreadsheet or word-processor application.

Having transferred data into the Mac from alien machines the Convert option on Jazz's Apple menu lets you make use of Multiplan files and anything else you have in Microsoft's Syllk format. Jazz will also convert Lotus 1-2-3 and Symphony files from the IBM PC.

The biggest threat to Jazz, because it aims at the same sort of professional business user, is undoubtedly Microsoft's new Excel program. Microsoft already does the Multiplan spreadsheet for the Mac, IBM PC and innumerable other machines, and intends Excel as a major challenger to 1-2-3. The Mac version of Excel will be out first, probably in November in the U.K. We have seen an early working version but have not yet had a copy to review.

Excel will cost less than Jazz, probably below £400, and embodies a competing philosophy to it. It embodies a very powerful spreadsheet, more different chart types and a more versatile graphics capacity than Jazz, and a limited database. It has no word processor, but instead has a powerful and easy-to-use macro facility which allows you to record the keystrokes you use in setting up a common task, which you then replay next time you come to do the job. Excel also offers better facilities to link and consolidate data from different worksheets, something financial users quite frequently want to do.

Microsoft quite clearly is aiming at the so-called power user of spreadsheets. Its product is more like 1-2-3 than Jazz, but in some ways it makes more sense. In Excel extra functions like database and graphics are tightly integrated round the core spreadsheet function. Microsoft recognises that this will not please everybody, but believes that if try to you end up with a compromise product.

Jazz does indeed show signs of compromise. It occupies over one and a half Mac disc drives, and in the word-processing function it is often slow. The spreadsheet works more quickly, but here we found that you can unexpectedly run out of memory.


Whatever users end up deciding, it is clearly good news for Apple to have Lotus, the biggest microcomputer software company, slugging it out over its machine, with the second biggest, Microsoft.

CONCLUSIONS

■ Jazz is a very professional program, produced with a great deal of attention to detail and with excellent, comprehensive documentation.

■ However, most users tend to specialise on word work, figure work or record-handling work; few people want to mix the functions very often. Perhaps the idea of an all-in-one package for the Mac is misconceived.

■ Even so, Jazz turned out to have more charm and simplicity than I expected. It is by no means as complicated to use as Symphony on the IBM PC.

■ We found a catastrophic bug in our release 1 copy of Jazz; this is not acceptable in a program for public release. If Jazz sounds right for you, perhaps you might find it worth waiting for the hopefully better-debugged release 1.1 or above. 

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MOUSE-DRIVEN WP

By Susan Curran

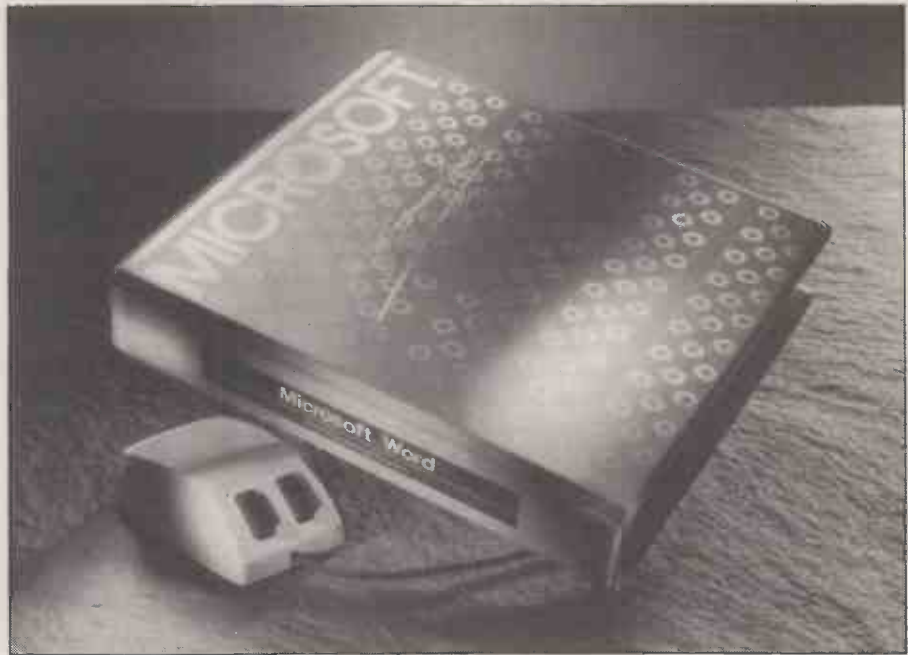
The revised version of Microsoft's powerful and easily learned general-purpose word processor is worth a second look by any IBM PC user — with or without its mouse.

Some word processors are aimed at those with a no more than a basic computer system. In these days of 16-bit machines, for serious office use this means something like an IBM PC with a monochrome screen and a basic 128K of memory. Others expect their users to have longer pockets, and Microsoft Word appears to fall into this camp. Though the program can be used with a scant 192K of memory, it needs 256K if all the commands are to be available. Though it will work with keyboard alone, it is really designed to be used with a mouse. And though it will work on the basic screen, it benefits from graphics and/or colour adaptors.

The people at Microsoft's U.K. operation were commendably anxious that I should get the Rolls-Royce treatment for this review, and thanks to their efforts I ended up with not just the review program, but a mouse and Hercules graphics card as well to ensure that it did itself justice. Though these refinements are all very nice they do come expensive, so I also looked at the program without them. On the other hand, I did use 640K of memory, including a RAM disc, to speed up the program operation on my hard-disc IBM PC/XT.

Word has, of course, been around for some time, and was reviewed for *Practical Computing* by Chris Bidmead in the December 1983 issue. It has, however, recently been improved, and this review is of the new version 2.0. Among the changes from 1.0 are the inclusion of a spelling checker, improved support for printers and graphics boards, and some simplification of the rather complex and much criticised style sheets.

Word comes on a series of floppy discs. Its fat manual is housed not in the usual library case, but in an elegant Perspex box which can double as a document stand. It has a rather unwieldy keyboard template which fits right along the top and sides of the keyboard, but if you use a mouse there is no real need to bother with it.



The manual with Word 1 was much criticised. It is said to have been completely rewritten, but I fear it is still not very good. It takes it for granted that all new users will learn the package through the training disc — that is certainly advisable, but it is still a sweeping assumption — and it is not well arranged for later reference.

The Word discs are protected, though a spare program disc is provided. The package can be installed once only on a hard disc. Installation is a neat and straightforward business.

The Learning Word program comes on a separate disc, and it is quite distinct from the Word program itself. It is very well

arranged, with nested menus, and takes you neatly and effortlessly through the basics. There are separate learning programs for mouse and for keyboard, and it is possible to select the order of learning, to skip exercises, and to use it as a look-up or refresher. I was a little apprehensive about the slow response of the program but this proved not to be typical of Word itself, which generally has a fast response.

Word starts with a blank editing screen into which you load a document if you wish. This screen has one or more bordered editing windows, with a command section below. The commands normally take up a rather greedy four lines — deduct two more from the total available for text, to allow for the top and bottom of each window — but they can be cut down to one line. They have to be brought by with an Escape or touch of the mouse button before any command can be selected. This makes obvious sense with a mouse: you can't select anything that is not visible.

The default window is simple and uncluttered. You can toggle on or off a ruler along the top, and can choose to have various types of symbol appear with the text if you wish. They seem to be desirable if you are using style sheets, but dispensable otherwise.

Word will handle up to eight text windows. They can be used for different parts of one file, for different files or for footnotes. Windows can be created

SPECIFICATION

Description: word-processing package with built-in spelling checker and ability to display multiple documents and typefaces on-screen

Hardware required: IBM PC with at least 192K of RAM — graphics card and mouse optional; ACT Apricot version forthcoming

Publisher: Microsoft Corporation, Seattle, Washington, U.S.A.

Price: £400 plus VAT, or £495 including mouse; existing Word users can upgrade to version 2.0 for £45

U.K. supplier: Microsoft Ltd, Piper House, Hatch Lane, Windsor, Berkshire SL4 3QJ. Telephone: (0753) 559951. Available now

(continued on next page)

(continued from previous page)

horizontally or vertically, and can be of any size. In practice, to have eight windows would be overkill, and it is impossible to imagine that anyone would wish to carry out serious work with eight documents visible on-screen at once. However, this generosity does make it extremely easy to handle footnotes, compare drafts or deal with wide documents.

As far as possible, all text is displayed on-screen exactly as it is destined to be printed. Normal justification is echoed on-screen, but sensibly enough microjustification is not. If you are using a graphics adaptor you can also see italics, boldface, double underline, small capitals and other type styles. This is the only real benefit of using a graphics adaptor, unless it seriously upsets you to see the mouse cursor appear as a block rather than an arrow, or you want to use the compressed text screen. To me it seems an avoidable luxury, but it is well executed.

IMPRESSIVE

Word is one of the relatively few IBM PC programs to reformat automatically on all text changes. It does so impressively fast and efficiently.

The compressed-text screen is available if you have a Hercules card, and provides 90 columns by 43 lines on a normal-sized monitor. The text is legible but necessarily cramped, rather like 80-column text on a QL. I dislike editing in this mode, where I found the response rather slow and the text straining to read, but it is handy for anyone who particularly wants to be able to see a lot of text on-screen at once.

The default typing mode is Insert; you can switch to Overtyping if you wish. Text is highlighted for changing type style, reformatting, or moving and copying. All of these operations work smoothly and rapidly, with no unforeseen limitations. Text is automatically deleted or copied by default to a buffer; as an option, it is possible to name and save buffers.

I did not expect to like the mouse, but quickly found that I liked it very much indeed. At first, it sounds as if a program centred on typing will not have much use for a mouse, but it really comes into its own when a document is being edited or reviewed. It is used for cursor movement, and it provides easily learned movements for scrolling, selecting commands, paging through alternative responses, opening windows, and most other program functions.

The different uses are easy to learn and

MICROSOFT WORD 2.0				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Documentation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

Now deserves to become the classic among PC word processors.

delightfully easy to employ. My only reservation was in the slowness of some of the command sequences, during which it was necessary to wait for several successive screen changes before choices could be indicated. The alternative key commands are a mixture of function keys and Escape/Alt selections, and are generally well chosen.

As you would expect from a high-priced program, Word has a full range of functions. Among them are a decently executed Merge, named glossaries for holding often used words or standard paragraphs, and multiple-column text. The program will queue documents for printing, but curiously it is only possible to print a document that has been called on to the screen; you can't define a print queue from disc.

STYLE SHEETS

The default formatting options can be a little clumsy to use, but it is possible to enhance them with the use of a style sheet. This rather oddly named formatting feature enables you to define and select from the styles available for characters, paragraphs or pages. They cover everything from justification and bold type to complex paragraph indents, blank lines left before or after paragraphs, and alternative tab settings. Style sheets can be used to select alternative sets of defaults — for reports, memos, drafts or other special types of documents, for example — or simply to streamline the formatting of indented numbered paragraphs or other features not easily catered for.

Users of Emacs programs like Perfect Writer will recognise the general idea. However, it is implemented rather differently in Word, and thankfully every active choice is echoed on-screen. Style

sheets are described in such fearsome terms in the manual that many users must be deterred, but in practice they are flexible and reasonably easy both to use and to edit. In fact they make it possible to reformat an entire document extremely quickly and easily.

The in-built spelling checker is a new feature of Word 2. It is anglicised, and with 80,000 words is comparatively large; it is also easy to use. Words are presented for correction in a brief sentence or so of context, and the program will provide a list of possible correct versions. If the word is not one of the them it is necessary to retype it in full, which is a little tedious.

For some curious reason, the spelling check is performed in capital letters. A neat feature is the provision of document dictionaries to hold proper names peculiar to a particular document. I also liked the additional utilities: a word-frequency listing, word count with or without a spell check, and various anagram makers and word finders.

REPAGINATION

Word is not a page-orientated program. Repagination is not performed automatically, but must be ordered before print runs. It is also necessary to order a repaginate before being able to use the Go to Page command. It is possible to order confirmation of page breaks, and to lock blocks of text together. Widow and orphan control is automatic.

One slightly tricky point is that top and bottom margins are not calculated automatically to provide room for headers and footers. If insufficient room is allowed, then the headers and footers are simply not printed.

Printer support is very sophisticated: 38 printers are named and supported, and there are catch-all options for others. There is even provision for the optimistic and determined to write their own printer drivers. Wherever possible, support is for full microjustification. Unusually, this is even provided on the Epson FX-80, using graphics mode to print each character. The output is slow, of course, but elegant, as you can see from the sample. I do wonder, though, whether anyone really wants to see microjustification from what is essentially a draft printer.


CONCLUSIONS

■ Word 2 is a powerful, well thought-out program which proved to be extremely reliable in use.

■ With the mouse it stands apart from the other IBM word processor, and I prefer it to any of them.

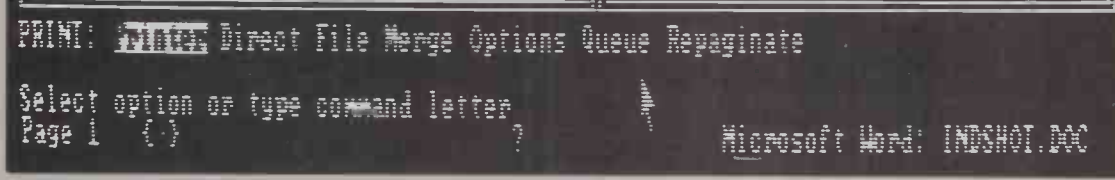
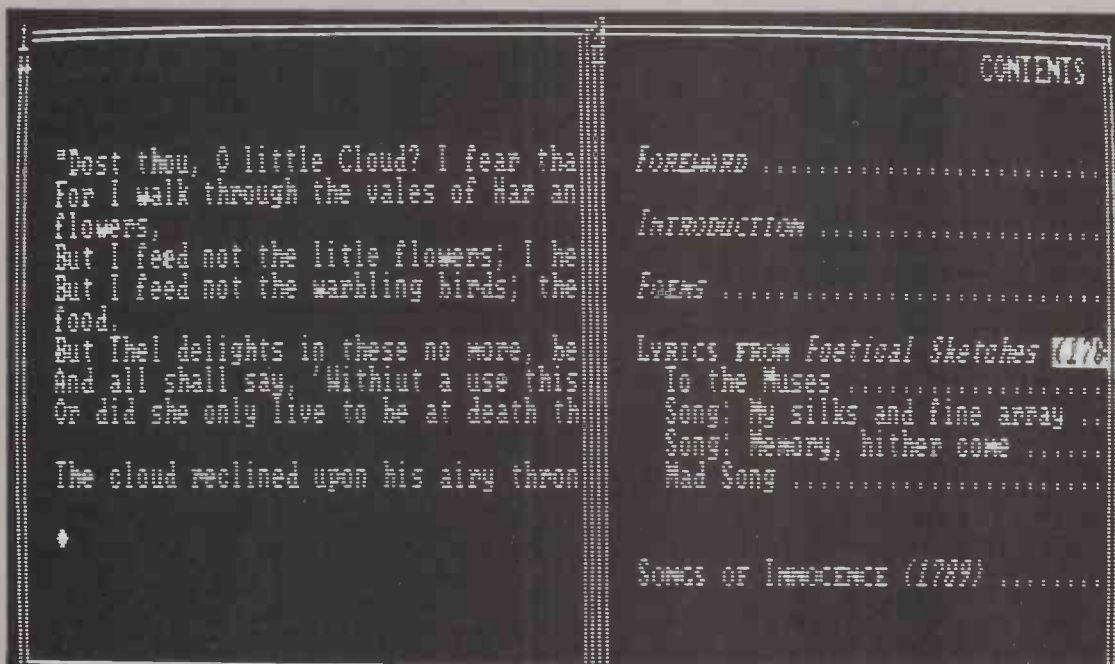
■ Without a mouse, Word has less to differentiate it from other competent programs, but still deserves a look.

■ Word is reasonably easy to learn, and very powerful for normal use, though it lacks some of extended maths and sorting capabilities of programs like Samna Word III.

■ At £400, the basic package is comparable in price with its main rivals; with the mouse it costs £495, which is quite a bargain. 

Word hyphenates only on demand, but it does so intelligently: it will automatically find sensible places for hyphenating words, and will avoid idiocies such as hyphenating between the last word of a sentence and the full stop. There is of course a manual override. Though the automatic hyphenation works well, it tends to be excessive — it hyphenated the ends of five lines running in one of my documents — and there is no way of controlling the width of the hyphenation zone.

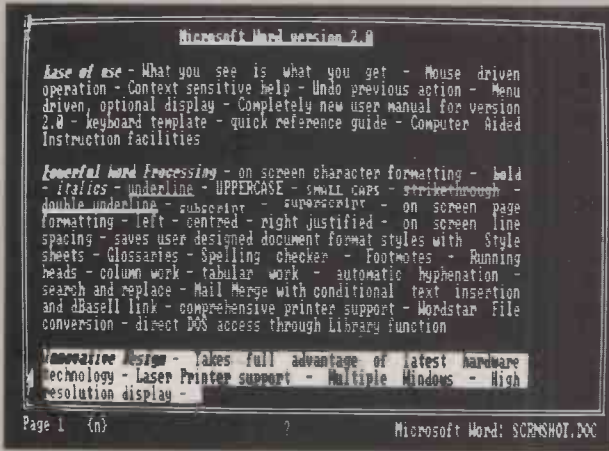
Word's automatic hyphenation facility works intelligently, though it can be excessive.



1

Select option or type command letter
Page 1 (n)

2



1

Word can handle up to eight text windows. They can be created horizontally or vertically and can be of any size.

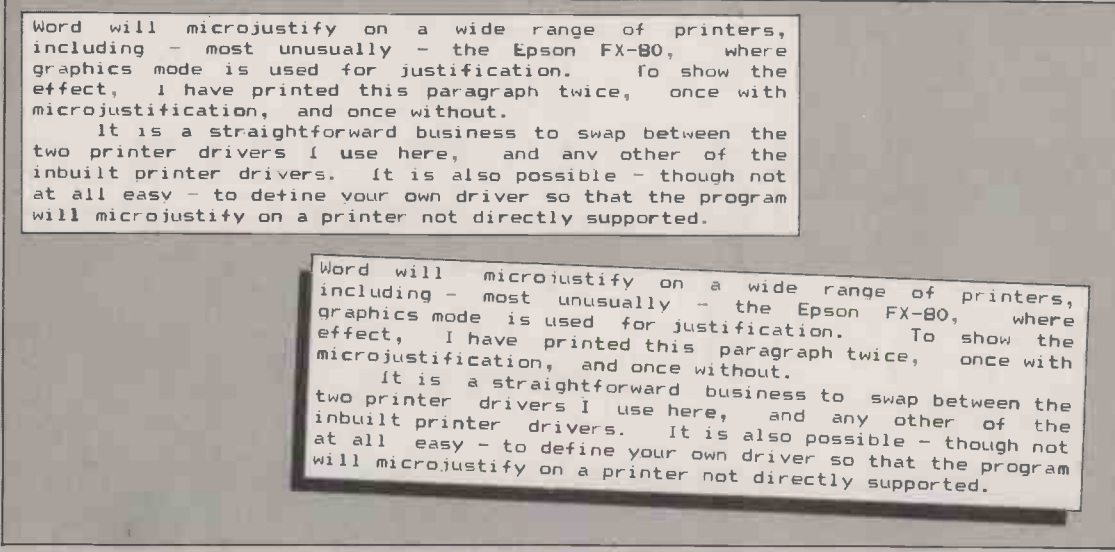
2

The Command line can be reduced to one line, thereby allowing more space for text windows.

3

Micro justified copy is elegant (below right) but compared to ordinary copy (below left) it may not be worthwhile as the output is slow.

3



THE MUSIC SYSTEM

MAKING THE MOST OF THE BBC

By Glyn Moody

The facilities of a synthesiser, sequencer and music processor are all available from a single low-priced program.

A glimpse of the way forward for music on micros was provided in last month's *Practical Computing* by two packages on the Mac. Unfortunately not all micros are blessed with the Macintosh's natural advantages of icons and mouse. Similarly, few micro owners are blessed with enough money to afford premium software like Professional Composer, which costs nearly £500.

The Music System for the BBC Micro goes a long way to meeting both of these problems. The Music System is the first product from Island Logic, a software offshoot of Island Records. It is not the last though, and already an enhanced Commodore 64 version has been produced. Costing £24.95, the BBC version uses an icon-like approach to offer a combined music processor, synthesiser and sequencer. Along the way, it manages to shield users from the gory details of the BBC's Envelope command, without any loss of facilities.

On loading the system, a control screen appears with five options presented pictorially. You scroll between them by tapping the space bar. Choosing the editor take you first to the editor status screen. Here you can set the disc drive, the name of the music file and the sound envelope to be loaded.

From the same screen you can choose key signature, time signature and tempo by moving the highlight bar with the Up- and



TMS comes with a comprehensive manual.

SPECIFICATION

Description: music processor, synthesiser and sequencer with printout facilities; up to four voices and 30 envelopes can be handled at once
Hardware required: BBC B: status of BBC B+ unknown; Commodore 64 version in the offing
Price: £24.95 including VAT
Distributor: Island Logic Ltd, 22 St. Peter's Square, London W6 9NW. Telephone: 01-741 1511

Down-Cursor keys. The default values of C major, 4/4 and 100 crotchets per minute can be changed using the left and right cursors. The right cursor increases values, the left decreases them, so you can scroll through the keys and set up time signatures. Tempos can range from 30 to 200 beats per minute.

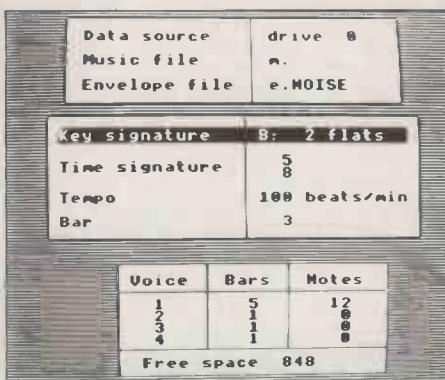
Once these basics have been established

you move on to note entry itself by pressing Return. This takes you to the edit screen. Lacking the mouse-directed cursor found on the Mac, the BBC has to adopt a different technique. A free-ranging note can be moved around the staff using the Up- and Down-Cursor keys. Its note length can be varied from demisemiquaver through to dotted semibreve using the Q and W keys. The space bar toggles between notes and rests. For each note you can also choose from 15 envelopes and sound levels.

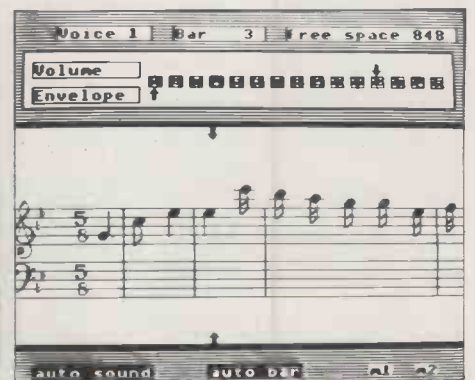
Additional music symbols are called up by pressing various pre-assigned keys; this is a rather tedious business. Barring is carried out automatically, though notes are not split if they over-fill a bar. In addition to this auto-bar facility, there is an auto-play which sounds each note as it is entered. Alternatively you can test out a note before



The TMS opening menu sports Mac-like icon images.



Key signature, tempo, etc. are set up on the editor status screen.



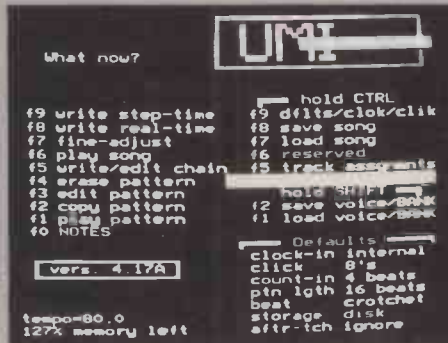
You enter music into the edit screen, where barring is carried out automatically.

(continued on page 62)

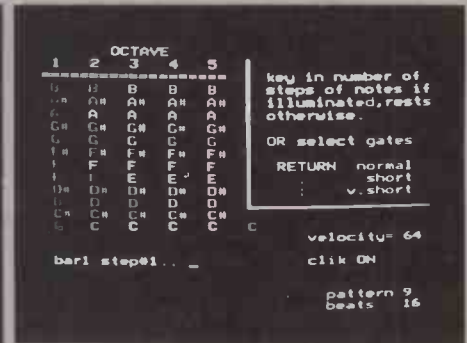
UMI-2B MIDI SEQUENCER



The tiny box on top of the BBC Micro transforms it into a sequencer.



The opening menu. Commands are mostly initiated by function keys.



The step-time entry screen. Notes entered appear in a highlighted colour.

Like The Music System, the cryptically named UMI-2B operates in conjunction with a BBC Micro to make music. But any resemblance ends there, for while The Music System acts as a friendly front end to the BBC machine's own music-making abilities, the UMI-2B sets up the micro as a sequencer that can handle up to 16 instruments, using the increasingly standard Midi data interchange format. The micro's sound-generating functions are all but ignored.

A sequencer is essentially a device for storing in digital form a sequence of notes and chords. The notes are often input from a synthesiser, one voice at a time, and then gradually built up rather as you would use a multi-track tape recorder.

The UMI-2B does not set up envelopes itself as conventional synthesisers, but uses banks of waveforms — known as presets — generated by a synthesiser or a Midi instrument. If you use a Yamaha DX-7 synthesiser you can also dump these banks to disc. The unit hooks up to the BBC via the 1MHz bus and user port.

All the software is present on ROM, so response times are more or less instantaneous, and there is no tedious loading of overlays from disc. A main menu handles all the commands, most of which are initiated by a function key, sometimes with Control or Shift.

Compositions are typically built up out of short sequences which are chained together. Each sequence can be set up in two ways, real time or step time, selected by f9 and f8 respectively. The first takes its input as you play it on a suitable Midi keyboard such as the DX-7. Beforehand you set up the number of bars and beats in a bar; the maximum is 16 bars.

Recording is started by hitting a large blue button on the UMI-2B. This produces a preset number of beats lead-in before the start of the sequence. Alternatively, you can just play, which does away with the need for any lead-in. After a sequence has been captured, it is automatically looped back to you.

You can then erase parts of it, modify it or overdub. One neat modification that can be applied is the auto-correct. This aligns your notes with razor-sharp precision against the main and subsidiary beats. A subtle data-compression option is also available.

As you play you can introduce a varying modulation using the Mod wheel of the synthesiser. This is, however, very memory-hungry. To save precious space you can carry out a compression technique which effectively halves the data-sampling rate, and so saves up to 50 percent of memory. This process can be repeated several times with little degradation of sounds.

The overdub facility is perhaps one of the most important. Essentially it allows you to dub further sequences on top of your first line, as it plays underneath. Overdubs can be junked until satisfactory. It is also possible to overdub a monophonic or polyphonic sequence with modulation.

As an alternative to real time, you can enter sequences in step time. What this loses in spontaneity and ease of entry, it gains in terms of power. For example, you can set up huge chords that would be physically impossible for one or even two people to play. Music is entered using techniques rather like those used in BBC Basic: you specify the note, its duration and velocity — equivalent to volume.

One improvement over the micro system is that pitch values can be entered from the synthesiser keyboard; they show up on a five-column representation of the keyboard. Pressing a note a second time removes it. A note or chord is entered by pressing Return. This slightly laborious process is repeated for each beat or sub-beat of the sequence.

The end product of both of these processes is a short sequence, or pattern as the program calls them; up to 128 patterns may be held at one time. Songs are built up out of these patterns by using the Chain command f5. This uses a very simple language for linking together several patterns, which may be transposed or repeated. Thus 4.2 means play pattern 2 transposed up by two semitones. Symbols such as { and } are used to set up loops, which could be endless for fadeout effects.

The Midi format allows up to 16 independent channels, which might correspond to 16 synthesisers. Paralleling this, the UMI-2B systems lets you set up 16 chains of patterns drawn from a set of up to 128. Each chain can be assigned to a separate channel, which may have one or more instruments hooked up to it. The first channel is the master, and forces all the others to follow any loops it contains.

If each of these 16 channels were a 16-voice polyphonic synthesiser, the UMI-2B could theoretically control all 16 voices on all 16 instruments simultaneously. Apart from the fact that few people have access to those kind of forces, the Midi format itself imposes limitations. First, its digital output is serial, which is necessarily a slow form of data transmission. Further, the rate is only 31.25 kiloband. The UMI-2B has gone some way to alleviating this possible bottleneck by providing two separate ACIAs to handle the asynchronous communications, instead of one. This effectively doubles the throughput of data.

Once chains have been set up, they can be saved to disc. One lack on the present system is a check that a new file is not overwriting one already present. Since a chain of sequences can represent hours of painstaking work, this is rather short-sighted. It is also possible to store a whole bank of 32 preset sounds from the DX-7. Up to 31 separate banks can be saved on one floppy.

The accompanying manual is slim but more than adequate. The current version of the UMI is, as its name suggests, the second in the line. Later enhancements in the pipeline include a facility for dumping preset waveforms from any Midi machine, and a Midi to CV converter which will allow the unit to be used with the older analogue synthesisers.

All in all, the UMI-2B is an enormously powerful add-on for the BBC that converts it from a rather staid educational tool into a mean music machine. Equally, it turns sonically impressive but relatively dumb keyboards like the Yamaha DX-7 into interactive composing tools. It may not be much to look at, but in terms of performance it holds its own against top systems costing five to 10 times more.

The UMI-2B costs £495 including VAT for the low-memory version, and £575 for the high-memory model. It is available from The London Rock Shops at 26 Chalk Farm Road, London NW1, telephone 01-267 5381; and 7 Union Street, Bristol, telephone (0272) 276944.

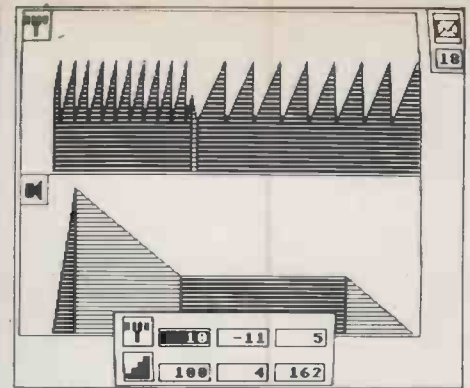
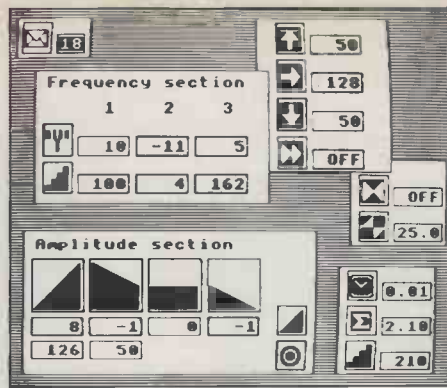
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entering it by pressing @. This is useful if you are varying the envelope.

There are three melodic voices and one percussion voice in total. One limitation of TMS is that having entered one voice you cannot keep it on-screen while you add another. This makes polyphonic music difficult to handle. The fourth voice is purely percussive, and uses a six-line staff which encompasses the 15 sounds available.

Different volumes and tone envelopes can be assigned to each note. However, coupled with the method of note entry, it becomes rather time-consuming doing this for every sound. One fault of TMS is that it tries too hard: by giving you such a range of commands and facilities, the basics become lost in a welter of multiple-key entries.

The synthesiser suffers from similar shortcomings, but is still an improvement over the horrors of BBC Basic's Envelope command with its 14 parameters that have to be set for every sound. One big advance is that you can obtain a graphical representation of the envelopes, and altering parameters produces visible changes. These occur on the synthesiser graph screen, which is two levels below the synthesiser status screen, accessed from the



Above left: The parameter screen allows you to alter the shape of the waveform.

Above right: Representation of the frequency and amplitude variations of a waveform.

means that quite complicated sounds can be built up. The disadvantage is that it is almost impossible to predict what they will sound like.

In a similar way you can set up the amplitude envelope parameters from the bottom left-hand window. Parameters set rates of change within the envelope to determine the ADSR — attack, decay, sustain and release — phases. A final window limits the overall duration of the note, assuming that a key is held down indefinitely.

At any point in this process you can press the @ key to hear the results of your parameters. By pressing the Return key you can move to the graph screen which presents both the frequency and amplitude envelopes. From here, you can also call up any of the parameter windows, one at a time, to examine and alter choices. Using the Copy key in the bottom right-hand corner of the BBC keyboard produces updated graphs. Although the selection of parameters is still a very hit-and-miss affair, TMS does at least go a long way in removing the obstacles placed in the way by the Basic.

What TMS calls the keyboard is a standard reversion to pretending that QWERTY is a piano keyboard, and then playing tunes on it. One big plus is the sequencer facility — basically, a digital recording system — which provides you with the equivalent of a multi-track record and playback facility.

Pressing Shift and Tab starts the recording; Escape turns it off. Rather neatly, the < and > keys are used for rewinding and fast forward. The Tab key is used for playback. Having recorded one track, you can then record another, perhaps with a different envelope. In this way, a complete four-part composition can be built up using TMS as a sequencer. About 860 notes can be stored per voice. Features that it lacks are the ability to loop sequences back, and the possibility of editing a sequence once it has been entered. For these and other more advanced capabilities, it is necessary to add an extra dedicated box like the UMI-2B.

All three kinds of files — music, envelope and keyboard — can be saved to and loaded from disc. The remaining options on the main menu allow you to link and print files. Linking enables you to play compositions consisting of up to 10 separate music files, exactly as each was written. In this way tempo changes can be incorporated into pieces, something which is otherwise

impossible on TMS. The printer driver allows you to print music files only. Single voices as well as multiple voices can be printed in either high or low resolution.

Many of TMS's problems should be overcome on the Commodore 64 version due for release about now. A built-in Midi interface allows a piano keyboard to be connected and used for input. As music is entered, the notes with correct pitch and time values are drawn on a staff in real time — a considerable advance.

On the Commodore, the Mac techniques have been taken even further: pull-down menus do away with the need for complicated control-key clusters. Other developments which Island Logic has announced for the update include the ability to handle six tracks, with cut and paste between them. Island Logic says that it will now be possible to edit keyboard files, and to add lyrics using a rudimentary built-in word processor.

There is also to be an update for the BBC program. This will probably be issued in the form of a tape which can be copied across to one of the two discs on which The Music System is supplied. The additional software will provide a Midi interface, and also the facility for swapping between music and keyboard formats.

Island says some 10,000 copies of The Music System on the BBC have now been sold, the majority disc-based. It success is well deserved. Acorn is even discussing the possibility of bundling it with future BBC model B machines. No doubt the new Commodore version, which the company says will cost about the same, will enhance its reputation still further. Other machines for which versions are under development are the Atari ST and Amstrad.

CONCLUSIONS

- The Music Processor is a powerful and versatile piece of software that makes the most of the BBC B's music facilities.
- It uses a highly visual approach loosely modelled on the Macintosh to ease some of the problems caused by the intricacies of BBC Basic's Envelope command.
- Partly as a result of its range of features, The Music System can be a little daunting in terms of command structure. These problems are likely to have been avoided on the Commodore version.
- Nevertheless, The Music System is streets ahead of any other BBC music program. Its nearest rivals are Mac-based and three times the price.

THE MUSIC SYSTEM

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

For someone wishing to explore all aspects of electronic music, particularly synthesis, The Music System is exceptional value.

main menu, and one below the parameter screen.

The parameter screen consists of six windows of varying size. The top left-hand one indicates the envelope currently being modified; up to 30 can be held at once. Using the spacebar to move on to the next window allows you to set up the frequency envelope. The profile of the envelope determines how much the frequency will rise or fall and in what time; up to three such changes can be set up. Here as elsewhere, movement between sections is effected using the cursor keys. Parameter changes are carried out using the Q and W keys, as with the edit screen. To this extent this is a consistency as regards key assignments within the various parts of TMS.

The next window sets upper and lower limits for frequency changes. Taken in conjunction with the previous parameters, this allows frequencies to rise and then fold over to the lower limit, producing siren-like effects. Further variations can be introduced by altering the modulation parameters. The interaction of all these frequency shifts

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MICROTEXT

DIALOGUE-PROCESSING LANGUAGE

By John Whiting

This well-established authoring system is now available for the BBC Micro.

Microtext is the first authoring system released for the BBC Micro. It was written by the National Physical Laboratory as a micro-computer version of the Edutext system, and was implemented on the BBC Micro for Acornsoft by Ariadne Software. All the BBC's *, graphics and sound commands plus some VDU calls have been made available within Microtext, greatly enhancing its power.

Any authoring system must be designed to make it simpler to produce software, so that inexperienced programmers quickly produce sophisticated programs. Authoring systems such as Pilot for, among others, Apple, Atari and Commodore machines, and Staf 2 for mainframes, superminis and CP/M machines with more than 64K of available RAM, have been designed with this in mind, mostly for educational use. So has Microtext, which also has facilities for database production, file writing and form filling.

The simplicity resides in the syntax of the authoring system, and in its provision of facilities which are not either possible or not easily programmable in other languages. The syntax of Microtext is easily understandable and is assisted by an extremely well-written and comprehensive manual. Example programs are also provided, which the Welcome booklet explains and encourages you to modify.

The major facility not easily programmable in Basic is Microtext's ability to recognise words, phrases or alphanumeric strings input by the user, and jump to an answer, a comment or some other response appropriate to the recognised input. This makes it easy to produce a much more natural interactive dialogue between user and program.

A Microtext program is thus a mixture of information presentation, questions, and text-recognition sequences with their associated Gotos. Before structuralists have hysterics it must be said that Microtext is a frame-orientated language: that is, one screen at a time is presented. So the structure of a typical Microtext program can be viewed as a logical sequence of procedures displayed on the screen in the order specified by

recognition of user input, overridden if necessary by programming. Also it is possible to write a linear program driven by successive choices from menus. However, this is just as easily done in Basic, so there is no need to use Microtext. The other defect of Microtext is its limited mathematical capability. It only supports integer addition and subtraction, though it can perform the usual logical tests on both integers and strings.

An expanded ROM version, called Microtext Plus, contains several new commands which tidy up some of the standard ones and fill a few blanks. It also permits more advanced file handling and the creation of up to 128 new commands through loading 6502 machine-code routines defined by the user. These can be

MICROTEXT

PC VERDICT

	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Value for money:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

The versions for a wide range of operating systems are excellent, but the licences are too expensive.

used to interface Microtext to almost any electronic equipment such as video disc, concept keyboards and the like. Since Microtext Plus is in ROM, all the memory in the 40- and 80-column modes is available unless extension files of subroutines need to be loaded from disc.

Microtext has four modes of use: Command, Edit, Test and Run. The disc boots up into Command mode, which allows program creation by entry of the command Frame n, where n is the number of the frame to be created. This puts Microtext into Edit mode. Creation of the frame by use of the function-key editor follows, using them in mode 7 for colour, graphics and the usual texts available in the mode.

Pressing the Escape key toggles back into Command mode to allow the Frame command to be used for the next one. When sufficient frames have been created — up to about 30 in the 11.6K available in mode 7,

The screenshots show the following content:

- Screen 1:** A list of commands and their addresses, such as `HELP 90`, `IMPANOCLOBU,IMB+120`, etc.
- Screen 2:** A question: "When a host is challenged by something foreign, and the issuer smiles grimly, what is the name given to the class of molecules that the host produces as a response to the challenge?"
- Screen 3:** The same question with the answer "DUMED" entered below it.
- Screen 4:** A response: "That I'd better tell you I wasn't! The word I wanted was IMPANOCLOBU,IMB. Feeling that you could have typed in the word REVISED, either would have done (though IMPANOCLOBU,IMB is a more precise word to use."

Four screens from a Microtext program module. Microtext's strength is its flexibility in providing varied responses and handling a range of replies.

SPECIFICATION

- Description:** Educationally orientated authoring system
- Hardware required:** BBC Micro model B, preferably with discs
- Supplier:** Vector Marketing Ltd, Dennington Industrial Estate, Wellingborough, Northamptonshire NN8 2RL. Telephone: (0933) 228953
- Price:** cassette, £49.85; disc, £59.80

VERSIONS FOR OTHER MICROS

Versions of Microtext for the Apple IIe, Commodore 64 and MS-DOS machines are under development. A CP/M-80 version for a wide range of machines will shortly be released by Transdata Ltd, 11 South Street, Havant, Hampshire PO9 1BU; telephone (0705) 486556. An expanded ROM version, Microtext Plus, is available on a pre-release basis from The National Physical Laboratory, Teddington, Middlesex TW11 0LW; telephone 01-977 3222. Information on versions for other operating systems and machines will be given by NPL.

The run-time Publishing System, which allows software authors to produce discs or tapes that will run independently of Microtext, has been advertised. The various categories of licence for its use are expensive.

There are three kinds of licence. Type A is for in-house publication and free distribution within a single institution, and is based upon the number of computers possessed by the institution. Type B is for publication and free distribution beyond the originating institution. Type C is for commercial publication.

For type A the rates range between £40 for one to 20 computers to £120 for over 51 computers. For type B the rates are £30 plus £0.50 per copy or £200 plus £0.10 per copy. Finally, for type C the rates are £6,000 plus £0.50 per copy or £250 plus £5 per copy. VAT has to be added to all copy prices. Further details on these arrangements can be obtained from the manager of the Education Division, Acornsoft, 104 Hills Road, Cambridge CB2 1LQ. Telephone: (0223) 214411.

or only 6 in mode 4 — the program module can be sent to disc by typing

```
SAVE "filename.TXT"
```

in Command mode.

Loading of program modules is done by typing

```
LOAD "filename.TXT"
```

When frames exist in memory, they can be accessed in forward or backward order via the Cursor Left or Cursor Right keys.

In Edit mode, the cursor keys act normally after toggling from Command by a press of the Escape key. Pressing the Break key does not crash the system but returns control to Command mode.

Frames can be Copied, Erased, Printed or Listed on the screen. They can be turned into Comment frames, which are non-executable like Rem in Basic. Run mode is used for running completed programs, and Test mode for program debugging.

The executable commands in Microtext are included in the frame in which they are to be obeyed. For example:

```
*30
$PAUSE CHAR 4
$LINE 2
£This is the first question.
$PAUSE 20
$LINE 5
How many issues of # PRACTICAL
  COMPUTING
£ have your read in the last year?
$FIX 6
```

```
?=
0→32; <4→34, <8→36, <12→38, 12→40,
  >12→42
```

```
**Number of PC read per year = <ANS>
$$SUMMARY SAVE, S.PCR
```

The *30 is the frame number. All Microtext commands are prefaced with the \$ sign. \$Pause Char 4 prints the text one character at a time with a delay of 0.04 seconds between each. \$Line 2 starts the printing at line 2 of the mode 7 screen. The # character represents the embedded control code for a mode 7 colour. \$Pause delays the printing of the next two lines at lines 5 and 6 of the screen for two seconds. \$Fix 6 fixes whatever the first six screen lines contain. Any

subsequent text will be displayed from line 7, unless otherwise specified. The ?= instructs Microtext to wait for a numeric input, which is then compared with the specified numbers and ranges on the next line. When a match occurs, the program jumps to the frame specified by the arrow of the match. An input of 6 would cause a jump to frame 36, for example. Alpha input would generate a status-line error message and repeat the frame. The penultimate line puts the answer input and its explanatory text into a summary in memory. Ans is a System variable — others are Time and Random — which contains the most recent input from the keyboard. The last command saves this input and text into a disc file called PCR in directory S. It could have been printed

```
$$SUMMARY PRINT
```

or output to the screen

```
$$SUMMARY
```

instead. Frames 32 to 42 display appropriate comments and then Goto the next question.

In its disc version without a 65C02 second processor, Microtext is best regarded purely as a mode 7 dialogue-processing language. The teletext-style graphics offered by this mode are not satisfactory for anything other than gross diagrams. The lack of a graphics editor for this mode means that you also have to search the lower-case keyboard for the appropriate key after looking it up in a book. Mode 4 only offers six screens with four colours per module. Neither offers animation. Graphics are a write-off as far as the disc version of Microtext is concerned, though this is greatly alleviated when the professional ROM version is more widely available because of the extra money.

The danger of this approach to the writing of CAL and CBT software is a lack of imagination. Using Microtext purely as a text editor with the choice of inputs restricted to letters or numbers from a menu can be done in any language, which is incredibly boring for the user anyway.

However, Microtext is a great deal more flexible than that. Recognition of free-

format input; windowing; summaries; overwriting any part of any mode 7 line; pausing and variability of character display speeds are only the beginning. Many other things are possible. The publishing system lets Microtext programs run independently of the disc containing the Microtext interpreter. The use of this is to be licenced in the same way as many mainframe software packages are.

The rates — see box — are very expensive if Microtext is to have any firm base of use throughout education. They appear to have been set by the National Physical Laboratory, not Acornsoft. The licensors ought to be made aware that schools and colleges do not have the attitudes or resources to make payment of such expensive licences an easy option. What is more likely to happen is informal distribution of software — piracy, in other words — with little profit to either Acornsoft or the licensors.

The other possibility which Microtext opens up is the control of slide projectors, video recorders and laservision equipment through the BBC's user port. Acorn itself recognised this — before the Olivetti takeover — by establishing a new company in association with Philips to produce an ABC-based laservision device controlled by an enhanced version of Microtext for marketing to educational and training authorities.

As soon as someone produces a cheap laservision disc which any television camera and computer can write to as well as read from, the real potentiality of the Microtext authoring system will be realised. A couple of gigabytes of off-line storage will come in very useful as well, and it can't be far off at the current rate of progress.

A Microtext user group has been established by Dr Ray McAleese, Director of the University Teaching Centre, University of Aberdeen, AB9 2UB; telephone (0224) 40241. The user group is independent from the NPL, though it does have its encouragement.

CONCLUSIONS


■ Microtext is a valiant attempt to produce a full authoring system on a micro with too little memory available, though the expanded ROM version will alleviate this.

■ The disc version of Microtext is best restricted to text processing in mode 7 unless a 65C02 second processor is fitted. Teletext graphics are too limited for CAL tutorial programs.

■ Novices to programming will require guidance from more experienced users before being able to make the best use of the system, though its documentation is excellent.

■ Because Microtext makes it so easy to produce drill and practice programs, most users are not likely to fully exploit the system to produce more sophisticated types of CAL.

■ The Publishing System and Microtext Plus is essential for serious educational use, though the expensive licences will not encourage this.

■ The inclusion of BBC OS calls, graphics and sound facilities is useful but means that programs containing them cannot be run on other Microtext versions. 

PC communication problems?



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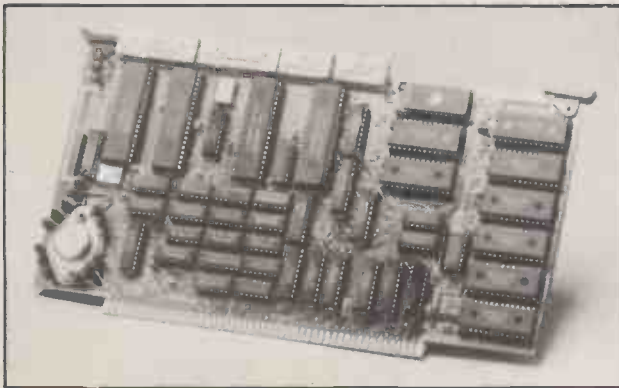
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S100 & VME components



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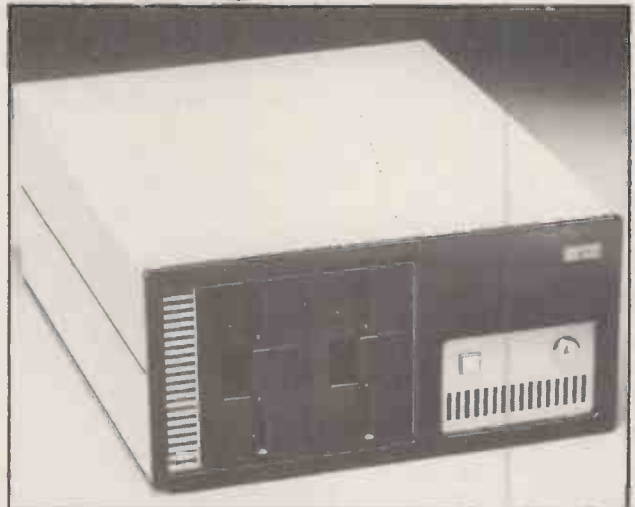
Sirton's range comprises single board computers, 8 bit and 16 bit CPUs RAM, EPROM, I/O and A/D boards, video and clock boards, hard and floppy disk controllers, plus miscellaneous accessories.

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All items are backed by Sirton's full technical support service plus our facility to assemble components to customers specific requirements.



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PRECISION MADE IN BRITAIN

FORECASTER

NO MORE GUESSING?

By Bill Bennett

Predicting the future remains an art, but Triptych's home-computer package shows how science can help as well.

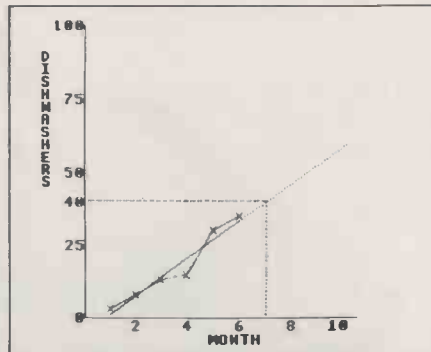
Forecasting is a very important function in any sphere of activity. Some of history's greatest successes can be put down to the accuracy of predictions. Disaster often corresponds to a bad or ignored prediction. If a decision maker has access to information about the future, in the shape of accurate forecasts, then he or she is well placed to make sound decisions.

Forecaster is a package in the Triptych Brainpower series of programs for home computers. Like the other products in the range — but unlike most home-computer software on sale these days — it is a combination of teaching software and applications software. Forecaster is available for the Commodore 64 and the BBC Micro. The review program used the Commodore cassette unit, and is also available on disc.

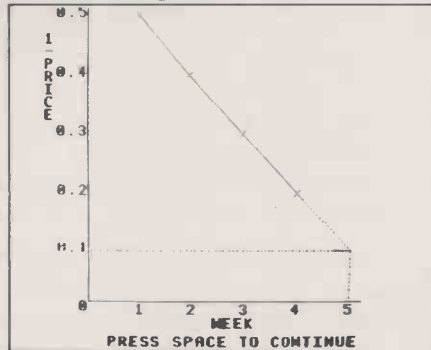
Packed with the cassette is a book that functions as a tutorial guide when used in conjunction with worked examples that are displayed on the computer screen. The book doubles as a manual for the applications software as well, and often includes background material on the topic in question as well as pointers to further sources of information. As software manuals go, the Forecaster book is very good; as manuals for software packages on cheap micros go it is wonderful. Not only is it lucidly written, it is also neatly presented.

Forecaster is said to take most of the guesswork out of forecasting "because it accepts that tomorrow's events are best predicted on the basis of today's facts". While it is true that computers can be very good at projecting current trends into the future, such a process is not really forecasting. Projections are really little more than a guide to help you discern trends. There is no way of telling if a downturn apparent in the most recent set of data is going to emerge as a small dip or the beginning of the end.

Yet predicting what the future has in store has now moved on from Tarot cards and yarrow stalks. In their place we have computer hardware and software designed to peep over the time horizon. Where there once stood a soothsayer is now a technician in a white coat holding a floppy disc.



The teaching program demonstrates linear regression (above) and transformation (below), among others.

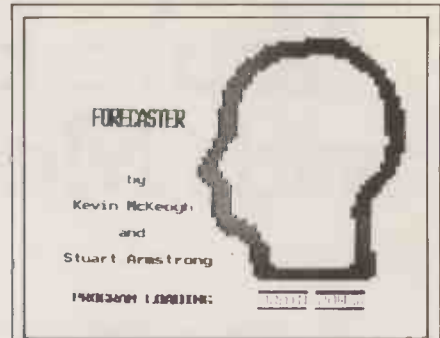


All this does not mean that the Brainpower Forecaster package is a waste of time. By using the mathematical techniques described, taught and applied in the Forecaster package, you can push current trends forward, provided you have the figures for previous years to guide you.

You can use Forecaster to perform time-series analysis which can take into account a seasonal pattern. So if you were projecting numbers of home computers sold season by season, with the main selling season being the months before Christmas, the projections would make sense. There are all sorts of ways you can play around with data sets, but Forecaster cannot predict unforeseen events, such as a price rise or fall caused by political factors.

Forecaster will also operate with causal models, which allow you to attribute a series of figures to a number of possible causes. So, for example, the profit level of a particular company might have as its possible causes the workers' wages, their productivity, bribes paid to potential customers, the value of sterling, raw materials cost and the chairman's tax-free perks. A complex model can be constructed relating all these factors, and the package will also tell you just how reliable your model is.

Although Forecaster is fairly simple, its only direct competition comes in the form of grossly expensive packages running on large micros, or even mainframes. Given a



SPECIFICATION

Description: forecasting tool aimed at serious users of home computers
Hardware required: Commodore 64 or BBC Micro; printer may also be connected

Publisher: Triptych Publishing Ltd, Sterling House, Station Road, Gerrards Cross, Buckinghamshire SL9 8EL

Price: £19.95 including VAT on tape, £24.95 on disc

U.K. distributor: Collins Soft, 8 Grafton Street, London W1X 3LA. Telephone: 01-493 7070

thorough knowledge of the theory you could write your own spreadsheet applications to provide similar facilities. However, if you do have that knowledge, your time is too valuable to waste duplicating someone else's work.

Forecaster is fairly slow, but then most Commodore 64 software is slow. Entering data can take hours, and there is no facility for loading existing spreadsheet data, but once entered data can be saved to cassette. If you intend to make real use of the software the disc version will be more useful, as saving and loading times are much improved. For less than the price of a restaurant meal, the program and the educational insight into numeric techniques it offers is good value.

FORECASTER		VERDICT			
		POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

More use as an educational tool than as a professional application package.

CONCLUSIONS

Forecaster is a fairly sophisticated application tool running on a home computer. Similar but more sophisticated competing packages run on mainframes at a much higher cost.

In addition to the application, Forecaster is an interesting introduction to the world of numeric computing. It also shows the potential of crude micros.

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The Interdriver LD192 Mains Powered Base-Band Modem

A rugged, self-contained modem-emulating line-driver for asynchronous or synchronous full or half-duplex data transmission. Either over DC-continuous unloaded lines up to 20Km at 110bps or at speeds up to 19.2 Kbps over shorter distance. Plus many other features. BT approved for connection to leased line.

M4000 Series Multi-Mode Modems Another recent addition, this series of transmit and receive Modems are both BAPT approved and conform to CCITT requirements. They are microprocessor driven, switchable between V21/V23 and are capable of working to Bell standards, answer or originate.

The number of features is astounding and includes auto-answer, self-diagnostics and a host of front-panel switches and indicators.



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All are BT approved and CCITT compliant.

Please send me further details. I am particularly interested in _____

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Address: _____

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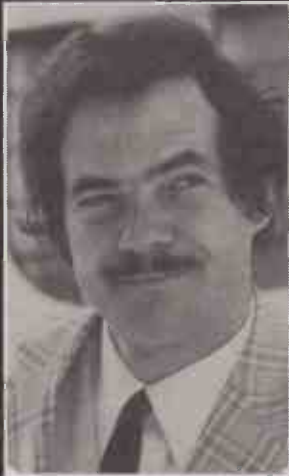
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I N T E R V I E W

ADAM OSBORNE

INTERVIEWED BY JACK SCHOFIELD



The expatriate Englishman who first made a name for himself as a computer journalist, and then launched the world's first transportable micro, is now attempting to transform a third area with his new company, Paperback Software. His range of software — which includes Executive Writer, Executive Filer, Paperback Writer, Paperback Speller, Draw It and My ABCs — is for sale at low prices through bookshops and small dealers. Distributors include Softsel, Computer Frontier and Computer Bookshops; some is bundled with the Tava Frontier Flyer.

What is the point of Paperback Software?

THE SOFTWARE industry today is probably more misunderstood and in greater turmoil than any other. If you look at the simple facts of the business, they fly in the face of reason. The bulk of software companies have one or two highly overpriced, easily copied products, out of which they are temporarily generating a small fortune if they're successful, no sales if they're not, and virtually nothing in between. They have staffs of hundreds trying to support one or two products. There is no other industry I know where people disregard cost of goods in setting prices. Only in software do you see people with a straight face talking about "perceived value pricing", which is to say, if you save tens of thousands of pounds from the use of a software package, you should be prepared to pay many hundreds of dollars to buy it.

Never have I had anyone explain to me why this argument should apply to software but not hardware. The truth of the matter is, it is not going to apply to software for very much longer. All we did was say that we will price our product in the traditional manner, based on cost of goods. And we will get the cost of goods as low as we can, just as every other business tries to do. And that is why, if you look at the packaging we have, you will find that it is so simple that we can manufacture it just as a book is manufactured, using existing high-volume machinery that manufactures books.

The cost of goods of one of our packages is always less than £2. The competition, on the other hand, like heavy three-ring binders and linen boxes which force them to drive their cost of goods up well over £20 in many cases. With my cost of goods I can sell a package for £50 and make a lot of money. And my argument is, if you really want a heavy three-ring binder and a linen box, I'll sell you that for another £200 — happy to do so.

The industry is full of plastic pundits who don't know what they're talking about and echo what people like to hear. They say people are looking for more features because they are so sophisticated they've used all the available features. In front of the many audiences I speak to I normally ask, "How many of you have tested the limits of your word processors and now need more features?" Normally I get raucous laughter as my response.

So why are software houses adding features?

THE REASON they are adding these features is because it allows the retail channels to say that you now need training for your software and significant after-sales support, both of

which are so expensive that the price of the software in the first place doesn't matter. The truth is that if you get rid of the complexities that most people never use you come up with a product that is simple enough that it needs no training and no support.

With low-cost software we introduced a policy, in America, of providing support over the telephone at \$1 a minute with a \$5 minimum. In addition to encouraging our users to read the manual, we have also found that they did not need support — the total net revenue of our customer-service department since the beginning of the year is \$200.

What sort of prices are you charging?

OUR PRICES range between £15 and £60. Our packaging is such that we can afford to sell it to people who are bundling at a price that makes it economical. With bundling and low prices we intend to create havoc in the software industry. It has already started, and I predict that if I come back a year from now there will not be a single mass-merchandise software package selling in the U.K. for more than £100, and that includes Lotus 1-2-3 and Symphony.

Paperback Software is publishing on the book-industry model. The key difference is that I do not have to bear the burden for R&D for new software. When prices come down as low as mine are, people don't care who the publisher is.


The current range is for the IBM PC. Are you planning any non-IBM versions?

YES. We will be converting Draw It and My ABCs to run on the Apple II series, and some future products to Unix. We are not planning to do anything for the Macintosh.

What's your view on copy protection?

WE COPY-PROTECT all our software at the present time, because the licence agreement that is normally packaged with software is probably not worth the paper it's printed on. If you sign a licence agreement we will sell you an unprotected backup diskette for £8, and then we have a contract. We also have a site licensing programme which is somewhat different in that we are seeking to protect our distributors and dealers. The way it works is that anyone can have a site licence by buying 20 copies at retail, and then paying a modest licence fee of about £400. That does not give them the right to make unlimited copies in-house, but the right to buy specially signed software from us.

Are you in effect debunking the software industry?

THE SOFTWARE industry has its head up its you-know-where. Can I be more specific? 

If you hold personal data on a computer, the Data Protection Act 1984 will probably affect you. The Act performs two important functions: it gives individuals the right of access to personal data and it regulates the holding and use of such data. Most European countries have had similar legislation in force or pending for some time. The greatest incentive to implement the Act in the U.K. has been the fear that other jurisdictions would not permit data to flow across their borders into a country whose data-protection laws were less effective than their own.

With limited exceptions, the Data Protection Act requires all those who control the contents and use of automatically processed personal data to register under its terms and to comply with the Data Protection principles. Individuals holding personal data concerned only with the management of personal, family or household affairs, or held only for recreational purposes, are exempt. However, professionals, small businesses and data users in education will all be required to register, along with the more obvious examples of hospitals, government departments, large companies and computer bureaux. A computer bureau will include any business which shares computer services with another, by mutual arrangement.

OFFICIAL GUIDELINES

As yet you can do nothing other than send for a copy of the *Guidelines*, a series of official, explanatory booklets. They come free from the Registrar's office on (0625) 535711. The *Guidelines* are fairly helpful, although they contain few practical hints. This is not the fault of the Registrar, but results from the vague terms in which much of the Act is couched.

What amounts to personal data in many cases will need to be decided as and when individual questions arise. The real value of the *Guidelines* lies in the tear-off slip at the back, which ensures that users receive notice of when and how to register. The Government has recently announced that registration will begin on 11 November this year, and data users will have to register before 11 May 1986.

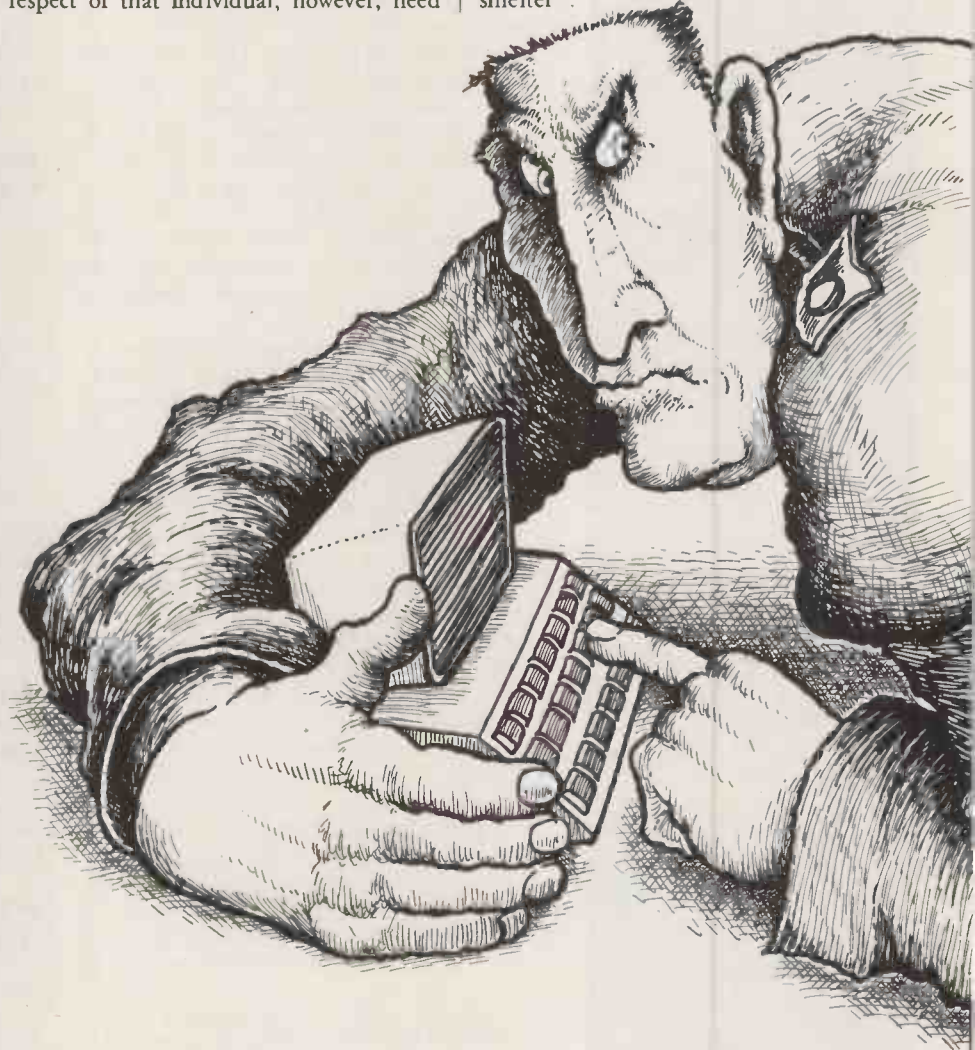
The Act is restricted to automatically processed personal data. Personal data consists of information which relates to a living individual who can be identified from the information.

Any file which contains information such as a person's racial origin or his or her educational qualifications, income, medical or employment record, credit rating, whether she or he has a mortgage or hire-purchase obligation or is entitled to welfare or other benefits, must be registered. So, too, must files containing any expression of opinion about the individual like "X drinks too much" "X does not get on well with fellow employees" or "X is financially irresponsible". The data user's intention in respect of that individual, however, need

not be registered, although a record of some other person's intention must.

Suppose that X applies to Finance Ltd for credit. Finance Ltd must register "X is employed by J Bloggs Ltd"; "X's income is £15,000"; "X has been refused credit by Moneycard Ltd because they regard his employment as insecure". Finance Ltd does not register "Finance Ltd have decided not to extend credit to X."

Or suppose that X has applied for a promotion at work. X's employer must register "X is very competent in his current post"; "X received a merit increment in September 1984"; "X performed well at interview". X's employer does not register "X is to be promoted to senior widget smelter".



THE Did Big Brother really arrive in 1984? We see who is affected by the Data Protection Act and how.

DATA PROTECTION RACKET

By Anne Staines

WHAT YOU HAVE TO REGISTER

Holders of personal data — this includes almost every business computer user — will have to register the following:

- The name and address of the installation
- a description of the personal data held there
- the purposes for which the data is used or held
- a description of the sources from which it was obtained
- a description of any other person other than the data subject to whom it may be disclosed
- names and descriptions of any countries

or territories outside the U.K. to which the data may be transferred

- the name and address of an individual who will be responsible for receiving and dealing with requests from data subjects for access

Users dealing with payroll are exempt. However, many users store additional personal information on payroll files. Therefore the exemption is likely to be of limited practical use, and confined to the essentials of name, address — if employees are paid at their home address — tax coding, national insurance number and allowances, say for excess hours, but not information relating to qualifications, medical records, etc. From six months after the appointed day, personal data may only be held by people who have registered with the Data Protection Registrar. It will be an offence to hold personal data not specified on the registrar or to use it for purposes other than those specified.

RESPONSIBLE PERSONS TO BE APPOINTED

Users will have to take the initiative in registering by completing a form, available from Post Offices later this year, and sending it to the Registrar's office in Wilmslow. A publicity campaign is planned, which will alert users to the fact that the time has come for them to act. Businesses will have to designate an employee to take responsibility for complying with the Data Protection Act. The choice of individual is left to the business concerned. However, ideally it will be sensible for larger companies to choose an employee from outside the computer services department in order to avoid possible conflicts of interest. The best solution may be to designate an employee from internal audit.

The Act sets out eight principles of data protection, which require personal data to be:

- obtained fairly and lawfully
- held only for one or more lawful purpose specified in the data user's register entry
- used or disclosed only in accordance with the data user's register entry
- adequate, relevant and not excessive for the purposes
- accurate and where necessary up-to-date
- not kept longer than necessary for the specified purposes
- made available to data subjects on request
- properly protected against loss or disclosure

All registered data users must comply with these principles, and two years after the appointed day, the Registrar will be empowered to refuse applications for registration by data users whom he has reason to believe will not abide by them.

The Registrar will have wide powers to tell businesses how they should comply with the data principles. He will be able to make orders forbidding businesses from processing personal data — thus effectively from using their computers — without prior warning and without proving that they are guilty of an infringement. There are those who object strenuously that the Registrar will have too much discretion in this area. On the other hand, he will have no power to make businesses give him information when he is investigating complaints, and will need a search warrant in order to search a computer.

ADMINISTRATION A HUGE TASK

However, aside from the problems of enforcement, the real difficulty which the Data Protection Act is likely to come across is one of administration. The registrar has 20 staff to manage what some sources predict will be as many as 400,000 applications for registration. The register will be held on computer, and the work of maintaining and updating it has been contracted out to a subsidiary of Thorn EMI. A provision of the Act exempting information which is required to be held by law should relieve the Registrar from having to register himself and — who knows — from having to prosecute himself for failing to comply with the Act itself.

One provision of the Act already in force is that which permits individuals to claim compensation for damage caused by loss or unauthorised disclosure of personal data. Data users and computer bureaux are required by the Act to take "appropriate security measures" against unauthorised access to or alteration or disclosure or destruction of personal data. Whether or not security measures are appropriate in any given case will depend upon the place where the data is stored, security measures programmed into the equipment, and measures taken for ensuring the reliability of staff having access to the data.

THE INDIVIDUAL'S RIGHT TO KNOW

As yet, individuals have no right to be informed whether personal data is held on them. This right comes into force in 1987. However, the onus will not be on data users to provide this information, but on data subjects to request it. Once the request has been made, the data user must supply a copy of the file within 40 days. This is subject to two exceptions. If a data user is not supplied with sufficient information to satisfy him or her as to the identity of the person making the request or to locate the information, or if he or she cannot comply with the request without disclosing information relating to another, identifiable person, he or she need not do so, unless he or she is satisfied that the other person has consented to disclosure of the information.

*Anne Staines is a Senior Lecturer in Law at Newcastle Polytechnic, and author of **How to Make Money from Your Software**. [E]*



MARK HACKETT



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ZF-148-21:	Dual Speed 8088 128K IBM compat	\$1372.00	£1320.00 RRP
ZF-158-21:	Dual speed 8088 four expansion slots	\$1762.00	£1695.00 RRP
ZF-158-42:	Dual speed 8088, 256K 10mb Winchester 3-IBM expansion slots	\$3286.00	£3160.00 RRP
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Zenith computers are equipped with color graphics and parallel and serial ports as standard. Color monitors at slight extra cost.

Mail orders will be delivered direct on tax free sales with proper paperwork throughout the nearest AAFES.

Direct dealer enquiries and volume purchases will be arranged either through OSIC or the local Zenith company reps. at standard commercial discounts.

You are requested to enquire about price and delivery for all Zenith products . . . Established dealers are suggested to add Zenith products if they have customer potential:

- * Medium/large companies with international or USA parents
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- * Graphics, color, or CAD applications . . .
- * PC requirements needing a complete product line . . .
- . . . portable, AT, luggable, complete/economic desktops

WANTED:

- * UK dealers near US bases and Oxfordshire/Midlands
- * New products to broker to US Armed Forces
- * Software for direct sale to overseas military

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Win a Zenith IBMulator

A Zenith ZF-158-42 with dual 360K floppies, 256K RAM, monochrome monitor, built-in colour circuitry, parallel and serial interfaces and MS-DOS. It would normally cost £1,995 plus VAT, which comes over to £2,290.



THE
£2,290
PRIZE

THE ZENITH ZF-158-42 is an IBM PC-alike with extras. Additional features include built-in colour circuitry that allows you to run colour software packages using the monochrome monitor, and a switchable clock speed which takes you from a staid old 4.77MHz to a turbocharged 8MHz.

To win this hot machine, generously donated by Zenith Data Systems Ltd, all you have to do is rank in order of importance the features of the Zenith listed right. For example if you think that a full-year warranty is the Zenith's most important feature, followed by no motherboard, put G first, followed by F as second, then your other choices.

- A. Maximum on-board RAM capacity of 768K**
- B. Five free full-length expansion slots**
- C. Runs colour packages even with mono monitor**
- D. Speed is switchable from 4.77MHz to 8MHz**
- E. Uses large-scale gate-array technology**
- F. No motherboard for greater reliability**
- G. Full one-year warranty**

The winning entry will be the one which matches or comes closest to the order chosen by the judges. In the event of a tie, the tie-breaker will be used.

Rules

1. The competition is open to all readers of *Practical Computing* normally resident in the U.K., except for employees of Business Press International Ltd or Zenith Data Systems Ltd, or their families.
2. Each entry must be written in ink on the official entry form printed here. Only one entry per person is permitted.
3. Completed entry forms should be posted to the address shown on the entry form to arrive not later than 31 October 1985. Envelopes must be clearly marked "Zenith Competition" in the top left-hand corner.
4. No correspondence can be entered into regarding the result of the competition and it is a condition of entry that the decision of the panel of judges is final.
5. The winner will be notified by post and the result of the competition announced in the first available issue of *Practical Computing*. The winning entry will be reproduced, and any other entries may be reproduced without payment.
6. The prize is a Zenith ZF-158-42. No cash substitute will be offered.
7. The prize will be awarded to the individual named on the winning entry form.

Entry Form for Practical Computing Zenith Competition

In my opinion, the order of importance of the seven listed features of the Zenith is (most important first):

- 1st
- 2nd
- 3rd
- 4th
- 5th
- 6th
- 7th

NAME.....

ADDRESS.....

.....

Tie-breaker

As a tie-breaker, devise a more catchy name than "ZF-158-42" for the prize machine.

.....

Return this entry form to **Practical Computing, Room L307, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS**. Write "Zenith Competition" clearly on the top left-hand corner of the envelope.

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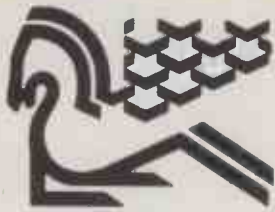
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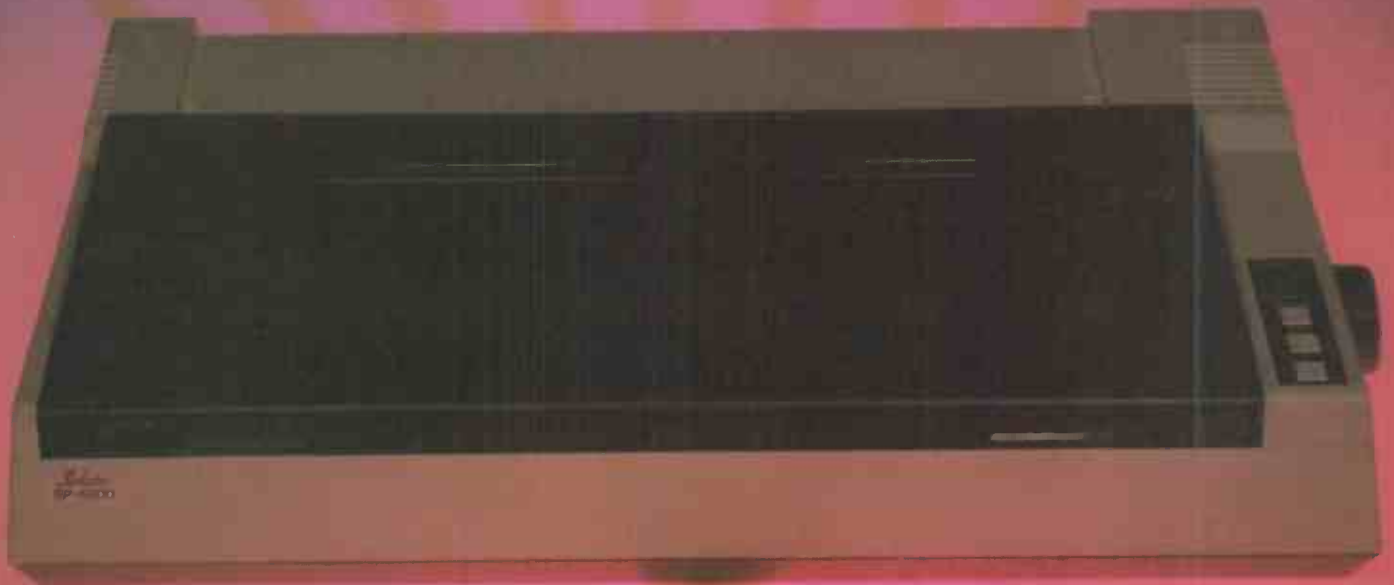
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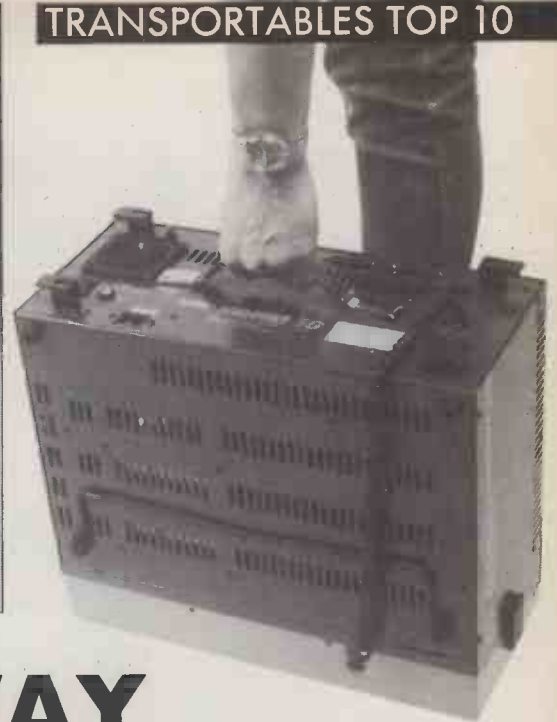
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Transportables may be briefcase-sized and elegant or luggable and utilitarian.



What distinguishes a transportable computer from a true portable is the necessity to plug it into the mains. Truly portable machines like the Tandy 100 and Epson PX-8 are designed for instant use wherever you happen to be — at work, at home in the garden, or travelling on a train. Transportables on the other hand are intended for use mainly in the office, but the design allows for the fact you might occasionally want to move the machine to another floor or take it home.

While portable machines are naturally enough very light in weight, generally between 4lb. and 10lb., the typical transportable is a good deal heavier. The pioneering machines like the Osborne 1 weighed around 30lb. and this weight has remained about the average for the most common type of machine, the suitcase-sized transportable.

Recently a new wave of smaller briefcase-sized transportables have come on the market. These machines still require mains power but they abandon the heavy cathode-ray tube display in favour of lighter, more modern flat-panel displays. The typical briefcase machine comes in at about half the weight of the average suitcase-transportable. In this survey we single out of the best contemporary machines in both categories, suitcase-sized and briefcase-sized.

Ever since Adam Osborne launched his pioneering Osborne 1 transportable, the suitcase-sized machine has been seen as a good-value, low-budget kind of computer. The idea of an all-in-one package including disc drives, display and keyboard made the transportable appeal to individual computer purchasers, who seem generally more cost conscious than corporate buyers. Modern suitcase-sized transportables generally keep up the tradition of good value for money.

Adam Osborne's other major innovation was to include in the price of his system software for doing the most popular computing tasks, like word processing and spreadsheet analysis; most of the early transportable suppliers followed his example. Software bundling has become less common recently


TAKEAWAY COMPUTING

Ian Stobie introduces our selection of 10 machines which offer the same power as a desk-top computer but in a package you can carry about.

since the emergence of 16-bit IBM compatible transportables, and is quite rare on briefcase-sized machines, most of which are 16-bit.

Most 16-bit machines comes with perhaps an operating system and Basic, but little more included in the price, although Sanyo, Kaypro and Tava bundle good software. But in general it is the traditional large eight-bit transportables which offer the best value in software terms. Eight-bit CP/M is becoming rather a backwater as far as new software packages are concerned, but if the applications you want to run are already available under it then it seems senseless to pay more.

The two types of transportable tend to appeal to a different type of user. Briefcase-sized machines do not have much of a budget feel to them. The display technology necessary to get the size down is expensive, so the machines are inherently unsuited to selling into cost-conscious sectors of the market. Most manufacturers have tended to go the other way, putting great emphasis on good appearance and stylish design, often adding functionally unnecessary features which serve the purpose of adding to the up-market appeal of the design. Put crudely, suitcase-sized transportables are bread-and-butter business machines, briefcase-sized ones are executive machines, with all that implies in a status-conscious culture.

All the same, as the price of the various technologies involves falls, the executive machines give a better idea of the future. The old-style transportables are a transitory category, kept bulky and ungainly by the current limits of affordable technology. 

SUPPLIERS

Apple: Apple Computer (U.K.), Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ. Telephone: (0442) 60244. Circle no. 361.

Compaq: Compaq Computer Ltd, Ambassador House, Paradise Road, Richmond, Surrey TW9 1SQ. Telephone: 01-940 8860. Circle no. 362.

Ericsson: Ericsson Information Systems Ltd, Maidstone Road, Rochester, Kent ME1 3QN. Telephone: (0634) 402080. Circle no. 363.

Grid: Grid Computer Systems Ltd, Unit House, 33 London Road, Reigate, Surrey RH2 9HD. Telephone: (07372) 41211. Circle no. 364.

HP: Hewlett-Packard Ltd, PC Group, King Street Lane, Winnersh, Wokingham, Berkshire RG11 5AR. Telephone: (0734) 784774. Circle no. 365.

Kaypro: Kaypro U.K. Ltd, PO Box 59, Ilford, Essex IG4 5NG. Telephone: (06286) 67547. Circle no. 366.

Olivetti: British Olivetti Ltd, Olivetti House, 86-88 Upper Richmond Road, London SW15 2UR. Telephone: 01-785 6666. Circle no. 367.

Osborne: Future Management (Portable Computers) Ltd, 38 Tanners Drive, Blakelands North, Milton Keynes MK14 5LL. Telephone: (0908) 615274. Circle no. 368.

Sanyo: Sanyo Marubeni (U.K.) Ltd, Sanyo House, 8 Greycaine Road, Watford, Hertfordshire WD2 4UQ. Telephone: (0923) 46363. Circle no. 369.

Tava: Computer Frontier (U.K.), PO Box 9, Letchworth Garden City, Hertfordshire SG6 7TE. Telephone: (04626) 73374. Circle no. 370.



OSBORNE 1

£570

The Osborne 1 is still on sale and at a good price. The original suitcase-sized machine now costs £570, and this includes an excellent bundle of CP/M software, including WordStar, Mailmerge and Supercalc. It is an eight-bit machine built around the Z-80 processor, with 64K of RAM and two 200K 5.25in. disc drives. Chief drawbacks are its 5in. screen displaying only 52 columns, low disc capacity and a weight of 28lb. These can be partly overcome by buying optional upgrades. Several more modern machines bear the Osborne name. The £995 Executive is really an improved Osborne 1 with a 7in. amber screen and more RAM. The £1,195 Express is more stylish but still an eight-bit CP/M machine.

FOR Cheap. Good bundled software.

AGAINST Antique. Tiny screen.



KAYPRO 2X, 4, 10, 16

from £1,116

Kaypro builds a range of good-value machines based on a Z-80 with 64K of RAM. The machines come with a large bundle of CP/M application software. The bundled packages include WordStar, Mailmerge and dBase II, and spelling checker, spreadsheet and report writer programs from Micropro's range. The Kaypro 2X has two 200K 5.25in. floppy drives, the Kaypro 4 has twin 400K drives, while the Kaypro 10 has a built-in 10Mbyte hard disc. The Kaypro 10 also has enhanced graphics and is good value at £2,088. The cheapest Kaypro is the single-drive 2, which comes with just WordStar and costs £1,116. Kaypro also does a 16-bit IBM compatible transportable, the 16, which costs £2,233 with twin floppies and £3,337 with a hard disc.

FOR Good bundle of software. Good value.

AGAINST Tinny. CP/M now in decline.



COMPAQ PORTABLE

£1,795

The Compaq machine has a 9in. green screen which displays IBM graphics as well as text, and also comes equipped with an output socket for an external colour monitor and printer. Construction is bulky but solid. Complementing the 16-bit 8088 processor inside the machine is 128K of RAM. You can optionally add another 128K on the main board and expand up to a full 640K if you use expansion cards. The Compaq comes with three empty expansion slots for IBM-style cards. Compaq offers several disc options, including a built-in hard disc the twin 360K disc model costs £2,195, and the Compaq Plus with 10Mbyte hard disc, £3,595. All Compaq machines offer close IBM compatibility.

FOR Expandable. Good display. Hard-disc option. Well-made.

AGAINST Not much price advantage compared to genuine IBM.



OLIVETTI M-21

£2,053

The M-21 has an excellent display, good expansion possibilities including a hard-disc option, and excellent performance. The 9in. amber screen offers an enhanced 640- by 400-dot resolution in addition to standard IBM graphics. Olivetti has built its machine around the full 8086 processor from Intel, which means many IBM programs run twice as fast on the M-21. Standard memory is 256K, but this can be expanded to 640K. The M-21 has three expansion slots for IBM-style cards. With two 360K 5.25in. floppy-disc drives the M-21 costs £2,053, and with one floppy plus 10Mbyte hard disc £3,305. All models come with printer and RS-232 cards. The M-21 has close software compatibility with the IBM PC, but the 8086 processor may create problems with certain IBM cards.

FOR Fast. Expandable. Good display. Hard-disc option.

AGAINST Heavy. IBM hardware compatibility.



SANYO MBC-775

£2,150

Sanyo's 775 offering is a well-built machine of conventional design distinguished by an excellent colour display and WordStar and Calstar included in the price. The machine is, at 40lb., very heavy, but it packs up easily for travel. The 9in. screen shows 640- by 200-dot graphics in monochrome and 320 by 200 dots in colour. In text mode the colour display is exceptionally clear. Inside the machine is 256K of RAM, expandable to 640K and an Intel 8088-2 processor. The machine is quicker than the IBM PC and almost up to the performance of the Olivetti M-21. Two 360K 5.25in. disc drives are built-in. IBM PC software compatibility is good, and the 775 has two free slots for IBM-type boards but memory expansion is liable to take up one of them.

FOR Colour screen. Bundled software.

AGAINST Heavy. Limited expandability.



APPLE IIc

£1,540

Equipped with its conventional CRT monitor the Apple IIc is no more transportable than an Apricot or Macintosh. But Apple also offers a flat LCD panel which turns the machine into a neat, briefcase-sized transportable of stylish modern appearance. Inside the IIc is a CMOS version of the 6502 processor and 128K of RAM. Veteran Apple users will recognise the convoluted memory map and the powerful but eccentric Applesoft Basic, which comes in ROM. The new LCD shows a full 24 lines by 80 columns of text and rather squashed Apple II graphics in monochrome. Built into the side of the machine is a 143K 5.25in. floppy disc; various external floppies and hard discs are available as options. The IIc runs the same software as the Apple IIe.

FOR Neat. Runs cheap Apple II software, including games.

AGAINST Declining eight-bit software base.



TAVA FRONTIER FLYER

£2,650

The Frontier Flyer is one of the best-value IBM compatibles of the new, compact style. It has two built-in 360K IBM-format 5.25in. disc drives, and packs up into a neat 15lb. unit for carrying about. Tava has announced an improved display that incorporates back-lighting. Graphics resolution is the standard IBM 640 by 200. The Tava machine comes with 256K of RAM, expandable to 640K, and is built around the 80186 processor. The machine has good IBM software compatibility and comes complete with word processing, spreadsheet, filing and drawing packages from Paperback Software. The Hong Kong built Frontier Flyer has one free expansion slot and is provided with an RS-232 serial port and a parallel printer port.

FOR Twin discs. Good memory expansion. Price. Bundled software.

AGAINST Poor display.



ERICSSON PORTABLE PC

£2,850

The Portable PC shows Ericsson's characteristic concern for ergonomic design. The screen is a flat orange plasma panel which can display enhanced resolution 640- by 400-dot graphics as well as standard IBM graphics and text. The keyboard can be use both clipped on to the main unit and separated on the end of a cable. Built into the side is one 360K 5.25in. floppy drive; a second drive can be attached externally or an optional 512K silicon disc fitted inside the main unit. It packs up into a compact 17lb. briefcase-style unit. IBM software compatibility is good. The system is built around an 8088 processor with 256K of RAM, which you can expand to 512K internally. An optional external expansion chassis allows you to add IBM-type cards.

FOR IBM compatibility. Bright, readable screen. Good ergonomics.

AGAINST Odd looks.



GRID GRIDCASE

£2,975

Grid is best known for tough bubble-memory machines, but the Gridcase uses a conventional Sony 3.5in. floppy disc, and is more thoroughly IBM compatible. It is built around a CMOS version of the 8086 processor, with standard memory of 128K expandable to 512K. The flat display panel is available in three options: conventional liquid crystal technology, a yellow-coloured backlit liquid crystal system and an orange plasma display. All show text and monochrome graphics at the normal IBM resolution. A colour output socket to drive an external monitor is provided. The Gridcase strays quite far from the IBM standard, with a different keyboard layout and the 3.5in. disc. Grid offers a number of software packages on ROM capsules.

FOR Good looks. Battery option. Quite rugged.

AGAINST Disc and keyboard not fully IBM compatible. Price.



HEWLETT-PACKARD INTEGRAL

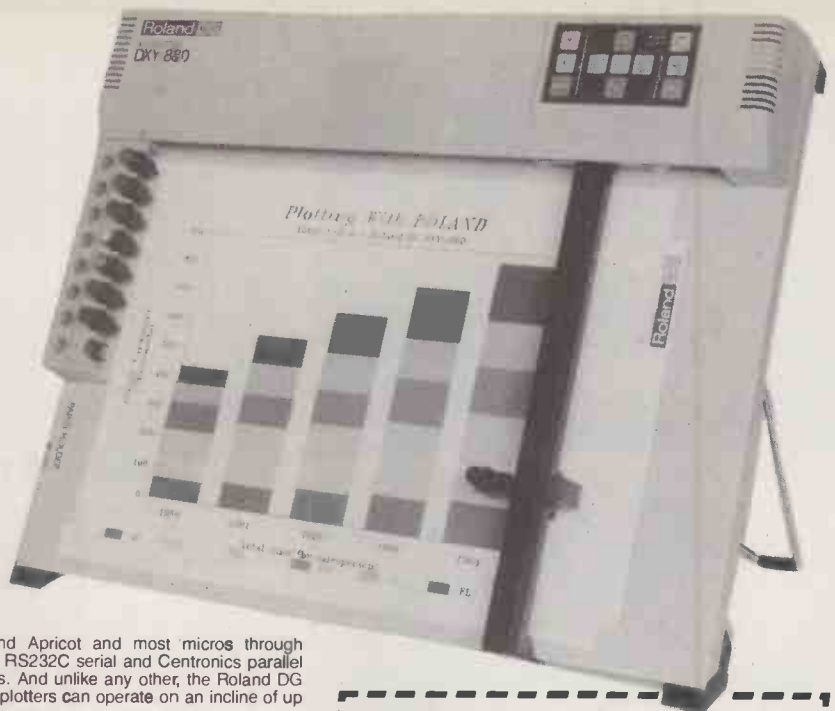
£5,450

The Integral PC is a specialised system aimed at Hewlett-Packard's traditional engineering and scientific market. Weighing 25lb. it is almost suitcase-sized, but it does use the new flat-panel display technology. The Integral runs under an HP version of the Unix operating system, and is built around a Motorola 68000 processor with 512K of RAM; you can expand this to 4Mbyte. Attached to the side of the machine is a large amber electro-luminescent display panel, which can show 255- by 512-dot graphics as well as a standard 80-by-25 screenful of text. Next to it is a 710K 3.5in. Sony drive. Built into the top is an HP Thinkjet printer. HP offers several external disc options, including a 15Mbyte hard disc. The Integral, is equipped with an IEEE-488 port and a bus expander.

FOR Number-crunching power. Built-in screen and printer. Unix.

AGAINST Price. Aimed at specialist group of users.

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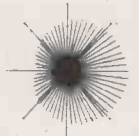
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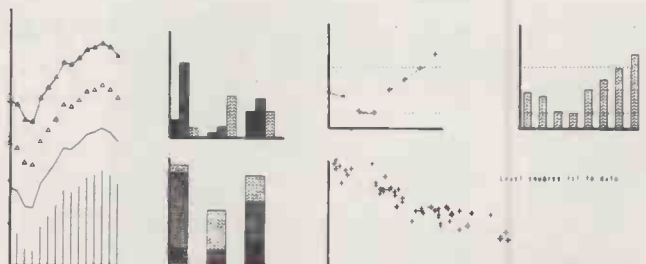
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As graphics come into their own they will alter radically the way businesses are analysed and managed. We suggest what to look for when setting up a system.

VISION & REALITY

By John Lewell

Business graphics is the use of computer graphics to format business information. If you like technical metaphors, think of it as a digital-to-analogue conversion. The computer takes all the numbers relating to your sales figures or profit and loss accounts, or indeed any set of numbers, and turns them into their graphic analogue as charts and graphs. The idea is that the charts and graphs are better carriers of certain types of information, especially those which involve trend spotting or comparative analysis.

At the same time, the process makes some new demands of the user. The ability to think visually is a prerequisite for

Business graphics may be added to practically any system running on any computer, be it a massive main-frame or a humble personal computer. The graphics capability can be purpose-written, using the software tools provided by such companies as Graphic Software Systems, Precision Visuals or ISSCO, or it can be an integral part of a business package. For most users, among whom integrated business packages have been especially popular, a graphics display is a convenient interface to analytical and statistical software.

In practice, however, some of the most successful applications of business graphics have involved purpose-written programs. One example is a system used by the chief executive officer of the Imperial Group, which is a company with interests in tobacco, restaurants and food products. Here the diverse nature of the company is kept under close scrutiny with business graphics. Thousands of graphs are kept on-line to graphics terminals in the boardroom. A director can not only call up any graph instantaneously but immediately press a single key to get the actual table of figures on which the graph is based.

The example quoted appears to be a particularly well-constructed system because it takes account of what people in business really require: sophistication and simplicity. It is no secret that these two qualities are often at odds with each other in business graphics. If you want to be creative, retaining complete control over all the parameters for generating the image, you must be prepared to study.

Yet even this potential dilemma has been overcome by pioneering software producers whose programs — thanks to cheaper processing — fall within the scope of this introduction. For example, Integrated Software Systems Corporation has developed a complete set of wall-to-wall

people who want to get the full benefits of using graphics as a business aid. For charts and graphs are not necessarily simplistic in concept. Some of them are extremely sophisticated.

Pie charts and bar charts aside, there are tri-linear charts which can show the position of an entity in relation to three axes; scattergraphs which can indicate, for example, both geographical positioning — if overlaid on a map — and relative size of individual accounts; and a whole variety of three-dimensional charts which can illustrate anything from comparative gross national products to concepts of catastrophe theory.



solutions. ISSCO's products are structured so that they can be used simultaneously both by expert statisticians and by secretarial staff. Whereas the expert will adjust the parameters of a graph to reveal the chosen information, a secretary can select formats from a chartbook of designs and feed appropriate data into them. In this way, last month's sales figures can end up as a graphic paragraph in a word-processed letter or report.

Adding graphics to most personal-computer systems usually requires more than mere software. While you can generate graphics in software, the task is more efficiently accomplished in hardware. The so-called open architecture of the IBM PC launched a whole new industry in the manufacture of graphics cards, the hardware which provides the basis of the display. Among graphics cards, those from Hercules have enjoyed great popularity, winning approval from Lotus and thus becoming essential if you want to see Lotus graphics on-screen.

▼ GETTING STARTED

Good integration is the key to getting started in business graphics. You must have the right card with the right graphics software with the right spreadsheet, database or accounting program. Deciding which is the right package is not necessarily simple, for the exact features of a graphics capability are numerous and various. For example, can several charts be drawn on the same page? Will the program label bars and volumes automatically? How many line widths are available?

There are dozens of questions which should be asked at the time of purchase. They should all be answered by the dealer and substantiated by demonstration. But one of the major problems of the computer industry as a whole is the high cost of selling. Ask only relevant questions, chosen from checklist — see box on next page — and try to see as many systems as possible.

▼ WHAT ELSE IS THERE?

One pitfall to avoid is the accidental purchase of a package which is not strictly business graphics but which is touted as something similar. Quite separate from real analytical business graphics are drawing aids and presentation graphics packages. Drawing aids include a variety of sketching and draughting systems, especially those for making specialised designs with libraries of graphic symbols. On the other hand, presentation systems enable you to construct elaborate pictorial designs of illustrations with added text for audiovisual or speaker-support applications. Both types of package have their uses in business, but they do not come under the general heading of management information systems (MIS), which is the true domain of business graphics.

Eventually, presentation and analytical

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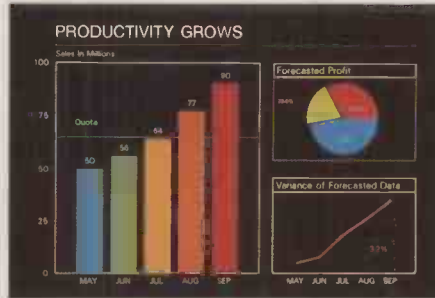
graphics will be combined for the small computer user, as display quality improves. Remarkable advances in hard-copy devices have made possible the generation of photographic prints for a fraction of the cost that prevailed just two years ago. This means that a full range of techniques will be available: not only the automatic generation of charts and graphs, but also the possibility of combining them with pictorial images, stock shots and photographs of products, people and places. The final images can then be fed to video or photographic output for use anywhere in the organisation.

SELECTED SOFTWARE

Space permits only a few examples of the many graphics packages that are available. The first is Microsoft Chart, a first-rate program which comes in two versions, for the Macintosh and the IBM PC. This package fulfils most of the criteria examined here. It links directly to Microsoft's own spreadsheet, or it will accept data from Lotus 1-2-3, VisiCalc and dBase II.

It offers a selection of 45 chart formats, grouped under eight main categories: line, pie, area, high/low, line/bar, scatter and vertical bar/horizontal bar. It can deliver multiple graphs simultaneously on the display in so-called two-and-a-half dimensions — overlapping windows — or side by side. Its mathematical functions are really useful in business: it performs averaging, cumulative totalling, straight-line plotting, curve fitting, and many other essential tasks.

A second example is Dataplot III, from Grafox, which runs on a great range of hardware. In fact, you do not even need a graphics display with Dataplot III, since it can simply send the data to a plotter peripheral directly. With links to dBase II and III, Multiplan, Supercalc, VisiCalc and other programs it will massage the data before



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plotting it, allowing the user to apply sophisticated mathematical functions.

Useful to the scientist and the business analyst, Dataplot III produces excellent text and allows images to be shuffled into an on-line slide show. This last feature is significant in that it simulates one of the basic requirements of presentation graphics: the ultimate display of selected images to colleagues and clients.

The third example is Chartstar, from Micropro International. It links to Infostar, a database program; Planstar, for financial planning; and to Calcstar, Micropro's spreadsheet program. Additional links to Lotus, Multiplan, VisiCalc and Supercalc make it an attractive proposition to users who are building their systems gradually rather than seeking a fully integrated solution at the outset.

Chartstar generates all the standard charts, together with three-dimensional histograms and pies. It provides Gantt charts for project management; curve-fitting with linear, log, exponential and power functions; and graph selection from a main menu. It is sophisticated but not too difficult to learn quickly.

John Lewell is author of Computer Graphics, a survey of current applications and techniques, published by Orbis Publishing, £12.95.

SUPPLIERS

Business Graphics Easel Psion, 22 Dorset Square, London NW1 6QG. Telephone: 01-723 9408.

Chartmaker Computer Design, 41 North Road, London N7 9DP. Telephone: 01-609 1878.

Chartstar Micropro International, Haygarth House, High Street, London SW19 5BY. Telephone: 01-879 1122.

Dataplot Plus Grafox Ltd, 65 Banbury Road, Oxford OX2 6PE. Telephone: (0865) 516281.

Delta Graph Compsoft plc, Compsoft Manor, Farncombe Hill, Godalming, Surrey GU7 2AR. Telephone: (04868) 25925.

dBase II/III Ashton-Tate (U.K.) Ltd, Oaklands, 1 Bath Road, Maidenhead, Berkshire SL6 4UH. Telephone: (0628) 33123.

DR Draw/DR Graph Softsel Computer Products, Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866.

DR Draw/DR Graph ACT (Pulsar) Ltd, Highfield Court, 24 Highfield Road, Edgbaston, Birmingham B15 3DP. Telephone: 021-455 7000.

(continued on page 85)

BUILDING A CHECKLIST

Business users should examine the following checklist of questions before deciding on a business-graphics system.

- Do we have a need for business graphics?
- Will the use of business graphics make our business more efficient? Will it save time and money?
- Will there be any additional benefits that are not necessarily quantifiable, such as obtaining higher quality in our presentations and company reports?
- Have we analysed our existing methods of making graphics?
- How will these methods be changed by the introduction of new techniques?
- Have we analysed the new applications for graphics?
- Will the production of graphics in new applications integrate with existing organisational structures?
- Have we discussed the proposals for business graphics with the company's data-processing managers?
- Have we discussed them with the graphics department?
- Can the data-processing and graphics departments work together?
- Will the proposed graphics systems be linked into a central company processing facility?
- Can the system(s) be integrated with existing or proposed word-processing facilities?

- Will personal-computer systems be adequate for the needs of individual users?
- Are the personal-computer systems to be used as self-contained work stations?
- Or are they to be design terminals, linked to a mainframe computer?
- Or are they to be used as design stations with hard copy being made by an outside service bureau? If so, what is the turnaround time? Is this adequate?
- How will the systems integrate with existing or proposed audiovisual systems?
- Will they yield adequate resolution for large-screen video?
- Is a video interface available?
- Will the personal-computer systems emulate slide-shows directly from disc memory?
- Do we need only one personal-computer system? Or should we devote the resources of each of several systems to producing a subset of charts and graphs?
- Is our primary application for analytical or for presentation graphics? If we have important applications for both types of system, can we integrate them?
- Do we need a networking capability?
- What types of hard copy are available? What types are essential? What types are desirable?

HARD-COPY TECHNOLOGIES

For business graphics, the choice of hard-copy technologies has become bewildering. They fall into three categories: drawing, printing and photographic technology groups. The images may be drawn on paper or on special film-based materials by plotters; printed by dot matrix, ink jet, thermal transfer, laser printers or other means; or photographed by a variety of computer cameras using any one of half-a-dozen methods of obtaining the data.

Pen plotters are more familiar to engineers than to office workers, a fact which may change since the price of plotters at the low end of the market has fallen. The cheaper models, such as the Epson HI-80 four-pen plotter, can be purchased for as little as £400. All plotters are high-precision machines using the random-scan technique of connecting end points of lines. Hence, resolution is the tops. A pen plot can be subsequently photographed and used in the highest-quality publication.

Among printing devices, dot-matrix and daisywheel machines are the most widely used, although they are not necessarily well suited to graphics applications. While most matrix printers have a graphics capability, their fixed dot positions are restrictive. Far more flexible, especially for colour, are the new ink jet machines which spray ink on to moving paper without touching the surface. For under £500 you can buy a Canon seven-colour ink-jet plotter, the Canon PJ, and link it directly to your IBM PC, BBC Micro or many other popular makes.

Even low-cost laser printers are relatively expensive, but they are 20 times as fast as ink jets. Until recently the only machines available cost over £200,000. These came chiefly from Xerox, but now the technology has been streamlined to desk-top proportions. Like photocopiers the machines apply toner, but to a laser-etched image. Quality is full publication standard.

Thermal transfer printers use rolls of film coated with alternating rectangles of yellow, magenta and cyan inks. Multiple passes are required to produce the images, but this technology delivers a full colour range rather than the restricted ranges of other types of printer. Thermal ink-transfer printers are made by IBM and Gulton Industries among others.

The most widely used photographic recorders are those from Polaroid Corporation. The company has a whole range of computer cameras which will produce instant photographs of the displayed images. Polaroid Palette connects easily to small business computers to make presentation-quality transparencies.



The Palette, like some other types of camera, can generate hard copy in colour even though the user may have only a monochrome display. The trick is made possible by the direct link between the graphic data in memory and the computer camera. For this reason the Palette is classified as a direct-drive film recorder.

Other camera types include terminal-driven machines, such as the LogE/Dunn Compact Colour camera. This is a desk-top machine with a library of exposure protocols that will calculate exposures for up to 24 film and format combinations. So 8x10 prints, 35mm. slides and negatives, and overhead transparencies can be handled without changing film backs or refocusing.

Like the laser printers, film recorders ascend in quality, speed and capabilities to a point where no expense is spared. The images you see in TV commercials are most often produced on Dicom or Celco equipment which scans each frame line by line. Up to 8,000-line resolution is possible.

For the business user, obtaining even 4,000-line resolution is still unusual. However, specialist low-cost computer cameras, like the Samurai from Image Resource, have been designed specially for chart/graph/text reproduction at this high level of quality. Graphic primitives — arcs, lines, etc — are generated on an internal CRT, with automatic exposure control as standard.

- What are the costs per copy for each type of device?
- Can we preview the image that will be on the finished slide/overhead/paper hard copy on the VDU? In colour? And how quickly?
- What are the resolution requirements for each of our hard-copy applications?
- Does the software provide sufficient design flexibility?
- Do we need design flexibility?
- Can we make use of high design flexibility without hiring extra creative staff?
- Is alternative software available for the favoured hardware configuration?
- Will custom-made software be necessary? Or will a standard package be adequate for our needs?
- Does the standard package provide for different levels of user-expertise?
- Is it command-driven, menu-driven, or both?
- How much training will be needed? Is training software available for the system we have in mind?
- What are the security features of the system?
- Will the package support an RGB colour monitor? Or a non-RGB colour display? Or both?
- Does it need double-sided or single-sided floppy discs? Does it run on hard disc?

- Will the program automatically scale the data values? Can it convert from linear to logarithmic scaling of values?
- Will it scroll the picture horizontally or vertically?
- How many type fonts are available?
- Are the fonts in a choice of sizes? Are they variable?
- What screen space is provided for positioning of text?
- Will the program enable drawing of three-dimensional as well as two-dimensional charts?
- Will it label bars and volumes automatically?
- Are colour choices selected by the program or does the user make the choice?
- How many colours are available? What is the palette size?
- Can several charts be drawn on the same page?
- How many line widths are available?
- Is the page position fixed or movable?
- Can the size of a graph be varied?
- What is the speed of the screen display? How quickly can the system change from one chart type to another?
- Is there a disc directory always on command?
- Is it worth waiting one month, two months, or six months for a new and improved system to come on to the market?
- By the time the system could be replaced by a superior system, will it have paid for itself? Will it continue to yield benefits beyond that date?



► **LOGISTIX** (n) a powerful spreadsheet with an extensive database and containing truly superior presentation-quality graphics. *Logistix also includes: the fourth dimension — (1) time management; (2) resource allocation; (3) task scheduling; (4) project planning. Commonly referred to as '... the best idea in business software since the spreadsheet'.*

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(continued from page 82)

Energistics Atlanta Data Systems, 350-356 Old Street, London EC1V 9DT. Telephone: 01-739 5889.

Execuvision IBM (U.K.) Ltd, PO Box 32, Alencon Link, Basingstoke, Hampshire RG21 1EJ. Telephone: (0256) 56144.

Gem Desktop Digital Research, Oxford House, Oxford Street, Newbury, Berkshire RG13 3JB. Telephone: (0635) 53304.

Grafix Partner Softsel Computer Products, Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Tel: 01-568 8866.

Graphics Editor Magus Computer Systems Ltd, 4 Cheap Street, Bath, Avon BA1 1NE. Telephone: (0225) 60965.

Graphics Toolkit ACT (Pulsar) Ltd, Highfield Court, 24 Highfield Road, Edgbaston, Birmingham B15 3DP. Telephone: 021-455 7000.

Graphstat 1 Xitan Ltd, Xitan House, 27 Salisbury Road, Totton, Southampton, Hampshire SO4 3HX. Telephone: (0703) 871211.

Graphstation American Computers and Engineers Ltd, 241A West George Street, Glasgow G2 4QE. Telephone: 041-248 2427.

Graphwriter Bonsai Ltd, 112-116 New Oxford Street, London WC1A 1HJ. Telephone: 01-580 0902.

IBM Graphing Assistant IBM (U.K.) Ltd, PO Box 32, Alencon Link, Basingstoke, Hampshire RG21 1EJ. Telephone: (0256) 56144.

Lotus 1-2-3, Symphony, Jazz Lotus Development (U.K.) Ltd, Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281.

Micro Supergraph Georgetown Computer Services, Georgetown House, Foxhall Road, The Broadway, Didcot, Oxfordshire OX11 7AA. Telephone: (0235) 819105.

Microplot MicroAPL Ltd, Unit 1F, Nine Elms Industrial Estate, 87 Kirtling Street, London SW8 5BP. Telephone: 01-622 0395.

Microsoft Chart Microsoft Ltd, Piper House, Hatch Lane, Windsor, Berkshire SL4 3JQ. Telephone: (0753) 559951.

Overhead Express Softsel Computer Products, Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866.

Praxis Microchart Praxis Business Systems, 71 St. John's Road, Tunbridge Wells, Kent TN4 9TT. Tel: (0892) 42267.

Statgraphics Cocking & Drury Ltd, 16 Berkeley Street, London W1X 5AE. Telephone: 01-493 6172.

Tell-a-Graf, Disspla, Cuechart ISSCO (U.K.) Ltd, ISSCO House, Madeira Walk, Bachelors Avenue, Windsor, Berkshire SL4 1XZ. Telephone: (0753) 857725.

The Draftsman Impex Software Ltd, Metro House, Second Way, Wembley, Middlesex HA9 0TY. Telephone: 01-900 0999.

Three key products represent the past, present and future of business graphics. We compare Lotus 1-2-3, Macdraw and the Apollo Domain, and on page 86 we look at how you can adapt your existing system to run graphics applications.

GETTING DOWN TO BUSINESS

By Glyn Moody

The widespread use of business graphics will depend on three things: the availability of software which offers integrated graphical features, hardware with sufficient processing power and screen resolution to run the software, and the right attitude on the part of the end-users.

Such an attitude is likely to come partly through increasing familiarity with graphics in many different contexts, and from new, user-friendly interfaces. Key stages in this evolution can be discerned in the three systems considered in more detail here.

Lotus 1-2-3 more or less started the revolution in business graphics, gaining widespread acceptance for the visual presentation of figures which had hitherto been confined to spreadsheet columns.

With its highly graphical environment, the Macintosh is very much the machine of today, for all its problems and the uncertainties concerning Apple. Finally, the Apollo Domain, though conceived largely as a very high-quality graphics work station, exhibits many of the graphics features that are likely to be standard on tomorrow's business machines.



▼ LOTUS 1-2-3

Apart from having an unprecedented marketing drive behind it, Lotus 1-2-3 was chiefly noteworthy for two things: its macro command facilities and its graphics. The first simply extended the basic idea of a spreadsheet, allowing you to set up strings of often used commands as readily available files which could be called up by one or two keystrokes. The second was more radical.

Lotus's claims for 1-2-3 as an integrated package were optimistic, but the linking together of numbers and graphs was certainly a great step forward. Previously, converting a spreadsheet into any form of graphical representation was at best slow and at worst impossible, but with 1-2-3 it is simply a matter of defining the type of graph required and the range of figures.

All the main classes of graph are available: bar, stacked bar, line, pie and x-y scattergraphs. In many ways it was their presence in Lotus 1-2-3 that helped establish them as the norm. Each variety lends itself to particular situations, as the examples on the next page show.

Bar charts are best applied to discrete data, and are useful for spotting exceptions. Compare the list of confusingly similar data in the spreadsheet with the much clearer bar graph. The slight variations are visible at a glance where the seven-digit detail of the

numbers serves only to obscure the data.

Pie charts allow analyses to be made of the relative importance of items to one another, which is again very difficult to do from figures alone. For example, it is immediately clear from the pie chart in the example that C and D have more than 50 percent of the market between them.

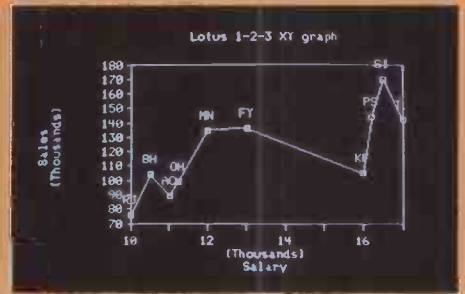
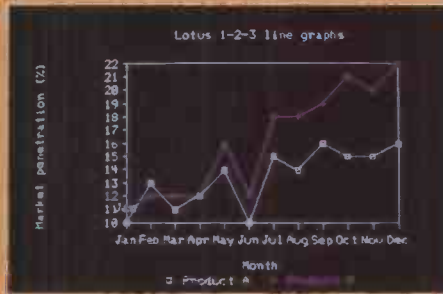
Similarly, a line graph can neatly indicate underlying trends, as shown in the second screen of in the series. It is also possible to spot correlations more readily, since the eye is very skilled at this kind of pattern recognition in a way that the brain, when trying to analyse ranks of figures, is not. The use of colour, even in this limited context, also helps differentiate between different sets of data, where numbers in a spreadsheet remain obstinately indistinguishable figures.

Perhaps the best indication of how graphical displays can bring out facts from figures is the x-y scattergraph. Trying to judge how one set of figures varies is bad enough, but judging one against another is almost impossible. The presence of any correlation shows up immediately on a scattergraph.

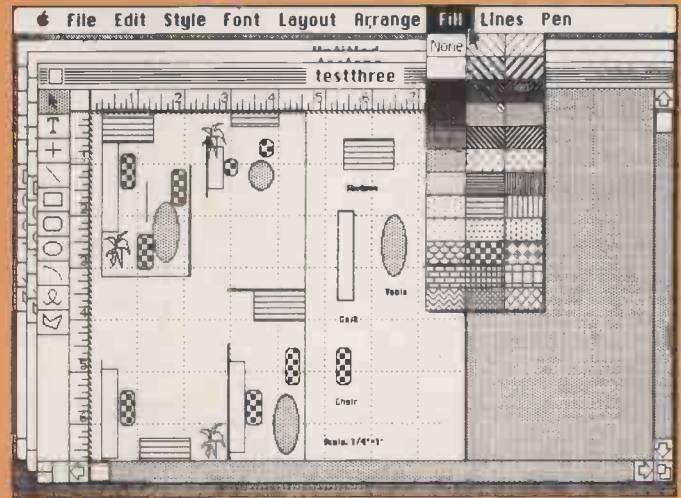
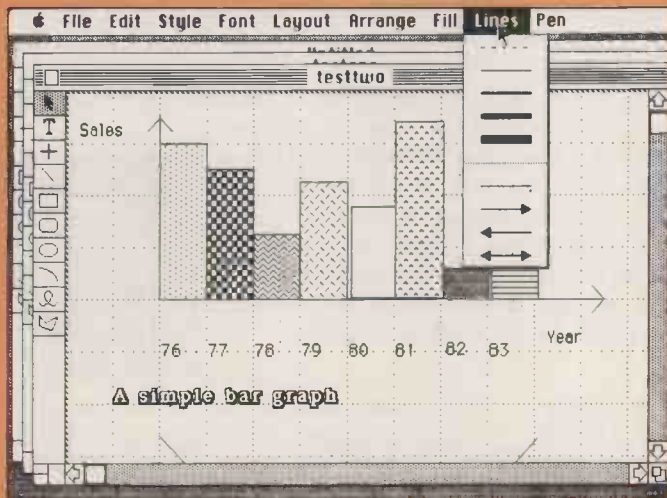
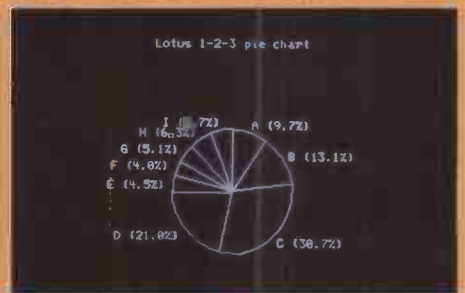
Though the graphs may be simple, correctly used they can throw up useful facts otherwise obscured by the welter of data. To this extent, Lotus 1-2-3's high-profile foray into the world of business graphics is a great

(continued on next page)

Item	Sales	Salary	Market Penetration (%)	Prod. A	Prod. B
BJ	75047	18000	Jan	18	11
BB	184732	18500	Feb	13	12
BC	89232	11000	Mar	11	12
BD	99264	11250	Apr	12	12
BE	134763	12000	May	14	16
BF	136957	12000	Jun	19	12
BF	165222	16000	Jul	15	18
FE	144758	14200	Aug	14	18
FI	170861	16500	Sep	16	19
FL	142748	17000	Oct	15	21
			Nov	15	20
			Dec	16	22



Lotus 1-2-3. The bare sets of spreadsheet figures (above) are not as easy to take in as the visual representation provided by 1-2-3. The line graph (top centre) demonstrates both correlation and divergence, as does the x-y plot (top right). Similarly, the bar chart (right) instantly points up which of a set of similar figures is the largest, while the pie chart (far right) makes it obvious that two elements account for more than half the whole.



Macdraw. Simple embellishments and captions are easy to add to a Macdraw chart (above left). Macdraw's features also make it easy to assemble simple presentation graphics of a more general kind (above right) using a set of building blocks.

(continued from previous page)

success. Less happy are the command structures needed to get to the graphs and those facts. Of course in this respect the graphics features are no different from the rest of the package, which has become a byword for lack of user-friendliness, whatever its other undoubted strengths. Throughout, you select options by moving down successive stages of a tree command structure, often with annoying to-ing and fro-ing between different levels.

On the plus side, there are a couple of features built in which make the graphing facilities very convenient. If you change any relevant detail of a spreadsheet for which you have already set up the graph parameters, it is possible to redraw that graph simply by pressing the function key f10, obviating the need to go through the whole command process again. In effect this introduces a What-If? facility into the visual display.

You can also save one or more sets of

graph parameters when you save the spreadsheet itself. This again avoids the problem of having to load them in manually each time you pull in the old spreadsheet figures.

For all its limitations, Lotus 1-2-3 has probably provided the first real taste of business graphics for the million or so people who bought it. In offering most of the basic graphing features that were likely to be needed in business, it represents the first era of business graphics on micros. Where it fell down was in the way in which you called up those features and in its general user interface. This was to be the next area of development in the field.

MACDRAW

Like Lotus 1-2-3, the Macintosh will go down in the annals of microcomputing as a key product. Through it, hundreds of thousands of people have become familiar with a totally different approach to working with micros, one based on pictures rather than words, and using a

pointing device instead of a keyboard. This in itself is of great significance for the widespread acceptance and use of business graphics.

It was certainly not the first micro to offer the user a operating environment around graphics. In the Apple family it was preceded by the Lisa, which was itself based on pioneering work done at Xerox's Palo Alto Research Center, and which resulted in the Star system. But in terms of the likely future direction of both interfaces and graphics handling, it is the Mac that is the key machine.

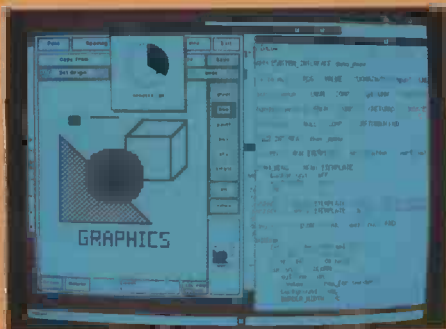
There are a number of products for the Mac which offer graphing as an extension of spreadsheet facilities, rather in the manner of Lotus 1-2-3. These include packages such as Microsoft's Excel with Chart, and the new Jazz integrated package reviewed on page 54 of this issue. But these are really only extensions of the older approaches. More innovative as far as graphics resources are concerned are Macpaint and Macdraw.

SUPPLIERS

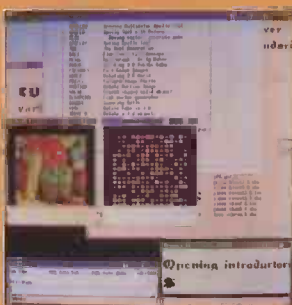
Lotus 1-2-3: £430; available for the IBM PC and compatibles from Lotus Development, Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281.

Macdraw: £99; runs on 128K Macs; available from Apple dealers; Apple is on (0442) 60244.

Apollo Domain: around £11,000 for the main system and £13,000 for the file server; available from Apollo Computer (U.K.) Ltd, Bulbourne House, Gossoms End, Berkhamsted, Hertfordshire HP4 3LP. Telephone: (04427) 75026.



Apollo Domain. Like the Mac, the Domain uses windows and icons (top left) to set up graphics screens. However, its capability for three-dimensional graphics in full colour clearly offers possibilities of a much higher magnitude. For example, the image on the left, generated by the Domain as part of an animated sequence, even takes account of reflections and refraction. The Domain's potential for windowing, three-dimensional display with hidden-line removal and shadow is shown below.




10MHz, 70Mbyte of disc memory and 1,024- by 800-pixels colour graphics.

The only difference between Domain and your desk-top of a few years' time is the price. The former will set you back £11,000 for the main processor unit which seems quite reasonable, and £13,000 for the hard disc, which does not. Yet even these prices are low compared to some other comparable graphics work stations.

Putting all the spec together gives you an astonishingly powerful desk-top machine that is fast even when it is handling full-colour graphics over 800,000 pixels. As an example of just how far such graphics can be taken, the large picture on this page shows a still from an animated sequence generated entirely by Domain. This includes calculating the effect of refraction through the translucent rods, and the reflections in the metal spheres. The end result is a good approximation to a high-quality photographic image. However, this very intensive task was not completed in real time: six hours of non-stop computing were required to generate all the frames for a couple of seconds of animation.

With such potential, it is possible to create stunning graphics and visual front ends. Because it is intended as a conventional design graphics work station the Apollo Domain has no business graphics as such, though its general facilities can cope with them readily enough. Like the Mac, it is mouse-driven and windows are used as a standard interface.

Although the Apollo Domain is currently well outside the normal price range of the business-micro market, its specifications are not so far off. For example, the Vienna PC, reviewed last month, has a screen resolution of 800 by 420 pixels. It also uses Gem as its front end, which allows a highly visual approach, and graphing facilities ready to hand as a matter of course. Similarly, machines like the Amiga — expected to sell for under £2,000 — have comparable graphics facilities as standard. Gem also appears on the Atari 520ST.

Lotus, the Mac and to a lesser extent the Apollo Domain, represent three stages on the path to ultimate business graphics which are integral to the way we use micros and the information they manipulate. If the promise of this evolution is fulfilled, the results could be quite a sight. 

Macpaint allows you to control every pixel on the screen, and to use the mouse to draw practically any image. For business graphics purposes, its power is almost too great: you need to be an artist to produce even simple output. Macdraw is a kind of structured version of Macpaint. Where the latter functions at the bit level, Macdraw works with graphical objects which can be manipulated in a very direct and flexible way.

A palette bar on the left-hand side of the screen offers the basic shapes such as lines, rectangles and ellipses. Selecting one of them lets you build up complex diagrams and graphs of all kinds quickly and easily. Once these graphical objects are on-screen, it is possible to manipulate them using the pull-down menus.

For example, shapes can be filled in, rotated, stretched and expanded or reduced. Standard operations like cutting, copying and pasting can be applied to any visual object or group of objects. The manip-

ulation of images in this way lends itself particularly to the creation of graphics and illustrations beyond simple charts.

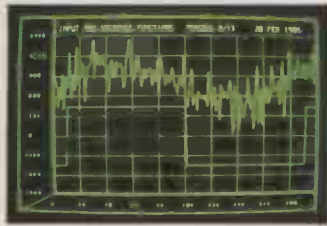
It is not possible with Macdraw to import figures from spreadsheets directly into charts. To this extent it is not specifically a business graphics tool. However, future systems will doubtless allow this together with the same kind of visual object manipulation described.

DOMAIN

The Apollo Domain graphics work station extends Macdraw's ability to manipulate and assemble visual elements into various charts, diagrams and illustrations, and lets you use similar techniques to produce high-definition images which can be in colour. Also like Macdraw, Domain lacks specifically business-orientated features. But in other respects it already offers today what could well be the desk-top of tomorrow. It has a powerful 68010 processor running at

SOFTWARE CHOICE

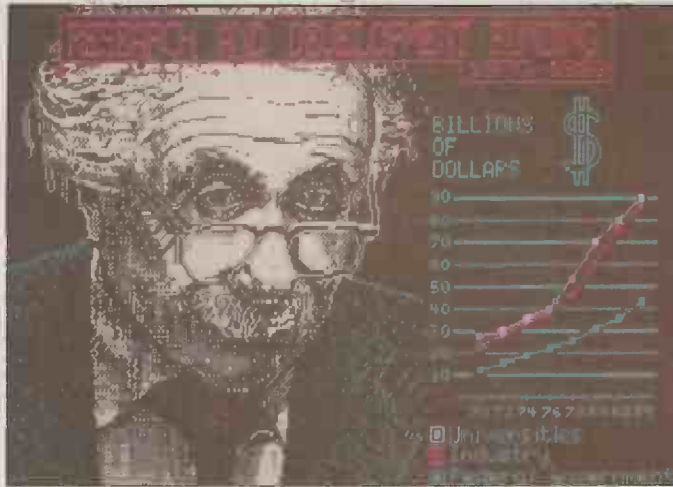
A selection of graphics programs and utilities for PCs.



dGE for dBase II and III

● Bits per Second has launched graphical extensions to dBase II and III. Unlike previous graphing facilities for the database, this is not a program that you use after the main dBase activities; you load dGE first, then dBase. dGE is then invoked from within dBase by means of additional commands which dGE adds to dBase's repertoire. In this way the graphing facility is claimed to be fully interactive within dBase.

Versions are available for both dBase II and III. Called dGE-2 and dGE-3, the cost is £90 and £120 respectively. The product is British, and is available from Bits per Second on (0273) 699720.



EV capture acts as a universal interface to VCN Execuvision.



EV Capture

● EV Capture allows you to print hard copy and transparencies from most application packages, according to the manufacturer. It also acts as a universal interface to VCN Execuvision, one of the most popular business graphics programs. EV Capture allows you to enhance screens from application programs by changing them into full colour and adding text and further graphics. You can also make use of the Execuvision libraries of pre-existing images.

The system will work with machines such as the IBM PC, PC/XT, PC/AT and compatibles. The cost is £100 and more information can be obtained from Visual Communications Network Inc., on 01-948 8601.

Microsolid

● Microsolid is a solid modelling program from the Cambridge-based Perspective Design Limited which runs on the IBM PC/XT and Apricot XI. It allows complex three-dimensional images to be built up and manipulated by icon-based commands. Operations include merging, subtracting and cutting three-dimensional objects, so allowing accurate and detailed models to be created.



The software costs around £2,500. In addition to versions for the IBM and Apricot, there are plans for one for the graphics work station from Whitechapel. Details on (0223) 323636.

Roboshow

● Roboshow is an image replay system that lets you create moving display images as well as rudimentary animation. Images are built up a screen at a time; components of these screens can then be taken and manipulated. For example, words can be scrolled on and off to the left, right, top or bottom. Up to 75 such command blocks can be set up for a sequence. The cost is £295 for the software which runs on the Apple II+ or IIe. More information on 01-263 8585.

Graphics directory

● The fourth edition of the *S Klein Directory of Graphics Suppliers* is now available. The latest edition of what is claimed to be the industry reference book has 204 pages containing 550 listings — a marked increase over the 135 present in the first directory published in 1980. These all relate to suppliers of hardware, software, systems and services in computer graphics.

The cost is \$65, plus \$10 for those outside the U.S. More information from S Klein Directory, Technology & Business Communications Inc., 730 Boston Post Road, PO Box 915, Sudbury, Massachusetts 01776. Telephone: (U.S. area code 617) 443-4671.



Mainframe graphics on 68000

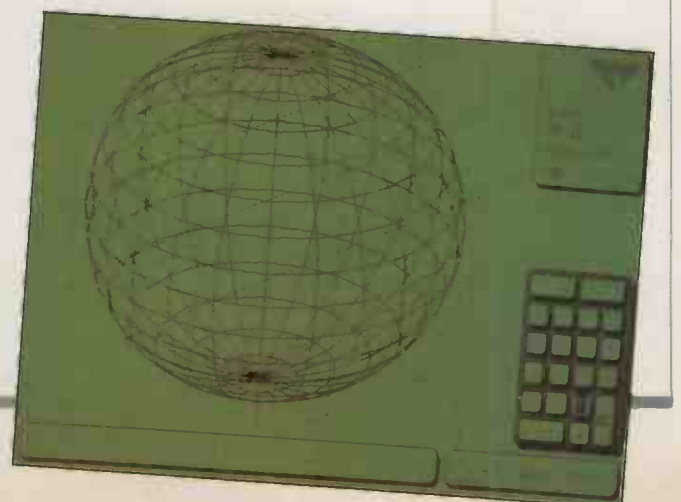
● IBM's GDDM graphics which runs on mainframes is available for any 68000 micro which supports the Mirage operating system. The emulator is hardware independent, and can be used with a range of terminals and plotters. The cost is around £1,000. More details can be obtained from Micro APL, which is distributing it. Telephone: 01-622 0395.



Presenter PC for IBM

● Dicomed has launched a software package which will produce colour slides with a resolution of at least 4,000 lines and up to 8,000. The Presenter PC is menu-driven, and can work with a mouse and digitising tablet.

After an image has been created, it is transmitted to one of Dicomed's colour recorders. This can be achieved either over a telephone line or by sending a floppy through the post. The monochrome software costs £995 and the colour version £1,995. Each print produced by the Dicomed process costs from £12 to £25. More details can be obtained on (0990) 27444.



ADD-ONS CHOICE

Enhancements and hard-copy devices to add a graphics capability.

Kodak Instagraphic system

● Kodak has launched a camera system for producing slides and prints from most VDUs. It consists of a number of cones of variable size which slot on to the VDU front. A camera assembly behind can take cartridges for either 35mm. transparencies or prints. The print option includes a special plate within the camera to compensate for screen curvature. For the slides there is a slide mounter for producing mounted transparencies. The print system costs about £320, and the slide version about £380, which includes the mounter.

In the same Instagraphic series there is also a copy stand for producing slides from reasonably flat hard copy. The cost is £550. Details on all these products can be obtained from Kodak on (0442) 61122.

Frame buffers

● Techex has introduced the Number Nine Revolution series of frame buffers, mainly designed to work with the IBM PC and compatibles. There are a range of formats: 512 by 512 pixels by eight or 32 bits, or 1,024 by 1,024 pixels by eight bits. Features include plane addressing whereby you can switch between banks of different screens and pixel addressing — that is, at pixel rather than any higher level. There is a genlock option which means that you can plug into a video recorder. The cost is from £1,910 plus VAT.

Microeye

● Digithurst has released the latest version of its video digitiser. This now has the ability to capture a 512 by 512 pixel by eight-bit image. Data is also made available in a byte-mapped file allowing display at user-definable thresholds and contrast levels.

Systems are available for the IBM family, Apricot, Sirius HP-200 series and the BBC. The Interface costs £495, and prices for a complete system with camera start at £900. More details from Digithurst on (0223) 208926.



Kodak's Instagraphic system operates from an ordinary VDU.

IBM PC high-resolution monitor

● X-Data has launched a 14in. CRT with minimum resolution of 720 by 400 pixels. To allow it to be used with the IBM PC or AT, there is a high-resolution video board, the STB Super Res-400. The manufacturer claims this has a low power consumption of only 6.5W and that the system will work with most standard PC software. The CRT costs £645 and the board £699. Details on (0753) 31292.

Colour graphics generator

● A general-purpose colour graphics generator has been produced by Data Applications Ltd. The manufacturer claims that the CGG-1 can provide most micros with high-quality colour displays using an RS-232 port. The CGG-1 comes with a Z-80A processor which is pre-programmed to receive ASCII commands from the host. The video memory consists of 64K arranged in four planes, allowing

each screen pixel up to 16 colours. Expanding the memory to 256K allows up to four pictures to be stored with rapid switching between them. Alternatively it is possible to create one picture four times larger than the physical screen width which can be panned left or right.

The cost is £1,285. More information can be obtained on (0285) 2215.

Data projection

● The EDP 58 from Reflex is a monochrome video projector that allows you to project VDU displays on to screen with a diagonal measurement of between 4.5ft. and 10ft. The displayed image has a 1,300-line resolution, and is claimed to have less than four percent distortion. A usable system costs about £5,000 and will work with most types of micro that have a composite video output.

Reflex also produces a colour version with a resolution of 1,024 by 1,280 pixels, the ECF-2000. It costs around £9,000. Details on both from Reflex at (0734) 884611.

Robocom slide presenter

● The Robocom slide presenter pack allows 35mm. slides to be made using the Apple II+ or IIe. At the heart of the system is the Polaroid Palette which has a flat-faced monochrome video screen with a camera attachment. Using a red, green and blue filter wheel it is even possible to produce colour slides from a black and white display. The price for the system is £1,495 and it is available from Robocom Ltd on 01-263 8585.



Colour recording camera

● Datacam has released a colour camera system which allows you to produce 3in. by 4in. prints or 35mm. slides from colour monitors. Two sizes of monitors are supported: 12in./13in. and 19in./21in. The Datacam 35 uses Polachrome transparencies. There is an autoprocessor to mount them, or they can be sent away for processing in the normal manner.

The print version costs £527 and £566 for the two sizes, and the slide version £781 and £820. More information on (0256) 461551.

Parallax 600

● The Parallax 600 offers high-speed colour graphics for machines using the Multibus, Q-bus and VME-bus. The resolution is 640 by 480 pixels in four- or eight-bit planes with up to 256 colours from a 16 million colour palette. A drawing speed of 12 million pixels per second is claimed. There is also a more advanced Parallax 1000 series. Prices start from around £5,000. Details from Dicoll on (0256) 461551.



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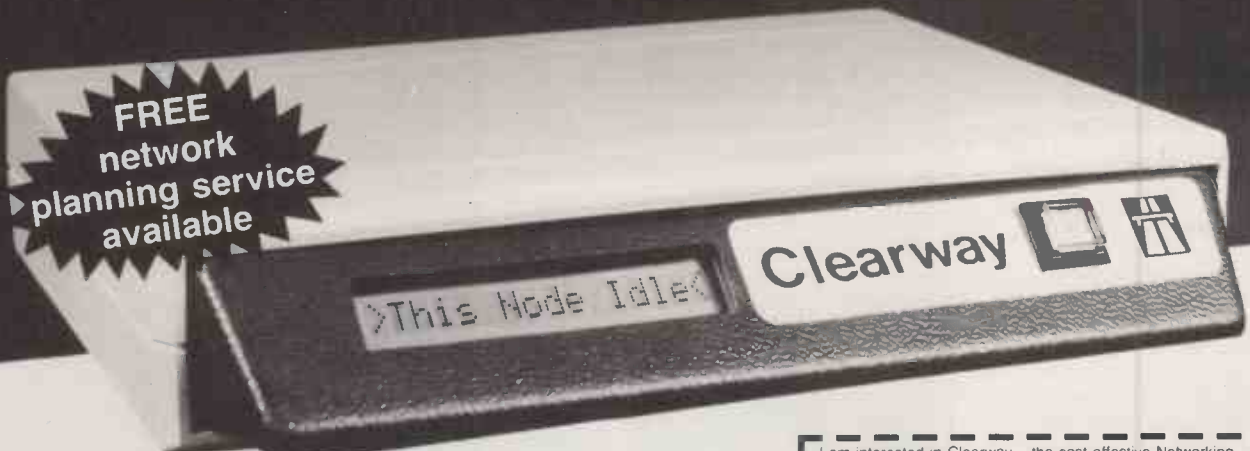
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FEATURES

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INPUT ROUTINES

Jim McCartney builds an input generator in Microsoft Basic

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ALTERNATIVE CURSORS

Swap PC-DOS's flashing underline for something more individual

BBC

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SPRITE MOVER: A machine-code program for animating sprites
LINE-NUMBER STRIPPER: Word process your code after stripping off the line numbers

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SIMULTANEOUS EQUATIONS: Solve real or complex equations on the PC-1500
STRING SORT: A machine-code sort for the MZ-80A

INPUT ROUTINES

Jim McCartney presents several tried and proven routines to help build a well-structured and friendly input generator.

MODERN database utilities can take you a long way, but there is still a need for special jobs to be done in conventional languages. This may be because complicated calculations or file structures are needed, or perhaps because the database turns out to be too slow, or simply because Basic is the tool you happen to have at hand. Microsoft Basic comes as part of the package on many business machines, and current versions provide good tools for professional programmers.

Database utilities provide good to excellent input-screen design functions. Indeed, this may be the chief feature of some of the less inspired contributions, on which they can conceal a rather ordinary and sluggish file structure. The Basic programmer, on the other hand, has the choice of Input, Inkey\$, or Input\$, starting from wherever the cursor happens to be at the time, and a variety of screen-control commands which vary from machine to machine. These must be built up into a set of flexible and useful tools which are structured and documented well enough to enable you to adapt them to any machine or data with the minimum of trouble.

I have yet to find an academic textbook which deals adequately with input procedures. Yet this is the part of the program the user sees most of, and therefore is probably the basis on which an applications program will be judged, assuming that it works at all.

Input procedures can be broken down into seven components: the screen control set, the message line, the screen format, the data dictionary, the input procedure, the validation procedures, and the input driver. Once you have used them you will find that they are highly adaptable to practically any data input requirements, on practically any machine, and will save you a great deal of trouble. In addition, you have total flexibility in screen design. Much of the coding described in this article was done on an ACT Sirius, but the only special feature about this machine is the screen control set.

The screen control set consists of the codes, subroutines or even machine-code calls — as in Applesoft — which enable you to display data on the screen in various places and in various styles. They vary quite radically from one machine

TABLE 1

Operation	Variable	Sirius code
Escape (see below)	E\$	CHR\$(27)
Clear screen	CL\$	E\$ + "E"
Home cursor	HM\$	E\$ + "H"
Reverse video	RV\$	E\$ + "p"
Normal (unreversed)	NO\$	E\$ + "q"
High intensity (bright)	HI\$	E\$ + "("
Low intensity (dim)	LO\$	E\$ + ")"
Cursor down	CD\$	E\$ + "B"
Bell	BE\$	CHR\$(7)
Clear high intensity	CH\$	E\$ + "+"
Cursor off	NC\$	E\$ + "x5"
Cursor on	CU\$	E\$ + "y5"
Delete line	DL\$	E\$ + "1"

to another, perhaps because they fall in a grey area between the language and the DOS. A common feature is the use of non-printing characters to implement or precede them. For example

```
PRINT CHR$(12)
```

will clear the screen on many machines, but the Sirius uses

```
PRINT CHR$(27);CHR$(69)
```

or Escape, E. The Escape signals that control codes follow, and the Sirius has an impressive list of them.

Most controls can be coded into mnemonic string variables, which you can then use freely on any machine. For example, if you want to use CL\$ to clear the screen, then on one machine code

```
LET CL$=CHR$(12)
```

and on another

```
LET CL$=CHR$(27)+"E"
```

Apart from this, the programs are then identical on the two machines.

It is useful to gather these assignments together in one place at the beginning of the program, which might be called the Data Division. Older machines and many home computers may have special Basic functions for some of these screen controls. I have found the set shown in table 1

particularly useful. They make up a fairly minimal set by today's standards, although you can get along without some of them.

Your program can thus start as shown in listing 1. You can now invoke any screen control simply by Printing the appropriate string, followed by a semicolon. This section of program has been tabulated for easy reading and reference. I have no better reason for starting the main program at 10000 than that it is an easy number to remember.

All subroutines should go earlier in the program, and the most frequently called should have the lowest line numbers, because Basic runs faster this way. It is a good idea to use the Data Division to declare all the variables you use, with some comment as to what they are used for, although in Basic it is not compulsory. You should also declare arrays and functions in the Data Division; however, if you are compiling, these generally need to be declared before the compiler reaches them.

The other necessary function in the screen control set is the cursor-positioning subroutine. It is convenient to pass two parameters to it: V%, to represent the desired vertical position, reading down,

top line equal to 1; and H%, to represent the desired horizontal position, reading left to right, left-most column equal to 1. On the Sirius this can be coded as

```
300 PRINT E$;"Y";CHR$(V%+31)
CHR$(H%+31);: RETURN
```

Use the coding peculiar to your machine.

It is useful to store the horizontal and vertical positions of the first character in each data field in V% and H% vectors. It is also useful in some applications to be able to shift the whole layout up or down by a given amount. You can therefore use

```
290 V%=V%(J%)+LN%:
```

```
H%=H%:
(J%):J% is field counter,
LN% is relative line position
```

Given that you are dealing with the Jth input field, Gosub 290 will position the cursor on the first character.

You can also use a string function:

```
DEF FNC$(J%)=E$+"Y"+
CHR$(V%(J%)+LN%+31)+
CHR$(H%(J%)+31)
```

and call this by using

```
PRINT FNC$(J%);
```

but I prefer to use the subroutine method because Sub 300 can be called independently.

It is useful to reserve the last line on the screen for program messages, and it is therefore convenient to have subroutines for writing and deleting the message line. You may prefer the first line, but the same principles apply. On the Sirius, line 25 can be reserved for this purpose as if it were an independent window, but many machines do not do this.

The message needs to stand out, so it is convenient to reverse the text and centre the message in the line. If you do not have reverse display, you may be able to flank the centred message with flashing asterisks, for example. The variable M\$ may be reversed for messages, so you can code as follows:

```
M$="Press RETURN to continue,
ESC to exit.":GOSUB 310
```

On the Sirius the same task can be

LISTING 1

```
100 GOTO 10010
10000 ***** DATA DIVISION *****
10010 E$=CHR$(27): CL$=E$+"E": HM$=E$+"H": RV$=E$+"p": NO$=E$+"q":
'escape, clear, home, reverse, normal
10020 BE$=CHR$(7): HI$=E$+"(": LO$=E$+")": CD$=E$+"B": CH$=E$+"+":
'bell, bright, dim, cur down, clear bright
```

LISTING 2

```
DATA DIVISION:
10040 PRINT E$+"x1"; 'enable line 25
SUBROUTINE:
310 M%=(74-LEN(M$))/2: M$=SPACE$(M%)+M$+SPACE$(M%):
PRINT E$+"YB";RV$;M$;NO$;HM$;: RETURN
```

coded as in listing 2, where
PRINT E\$"Y8E"

is the Sirius screen code for positioning the cursor; the other strings are as already defined. On quite a different machine, the Xerox 820, I used flashing asterisks. The code, shown in listing 3, is self-explanatory, except that CUP\$ means Cursor Up.

There is a good deal of homing the cursor in these subroutines; these and the cursor-up movement were necessary in order to prevent the display scrolling up under certain conditions, which is always a hazard when working on the bottom line. It is always necessary to home the cursor at the end; experience has shown that it is sometimes necessary at the beginning as well.

Line 320 then deletes the message and 330 give the option of a temporary message line — see listing 4.

With the screen control codes and the message line out of the way, we have swept all the machine-dependent Basic into a tidy corner or two, where it can be kept under control. All the rest of the coding — with the exception of printer control codes — will be in standard Microsoft Basic, and therefore machine-independent and portable. We now have: lines 10010 to 10050 to set up the screen-control strings; Sub 290 to position the cursor for screen field J%; Sub 300 to position the cursor at (V%,H%); Sub 310 to write a message; Sub 320 to erase a message; and Sub 330 for bell and transient message display.

It is a good idea to display an input screen form, complete with prompts, before any data is entered. This gives the user a blank form to be filled in. If there is more data than can be contained in one screen, it is generally best to page the screens.

Scrolling is a pernicious practice, except in the odd case where the record will fit comfortably into the screen width, and provided that you have a back-scrolling function. In this case, the user can fill in one record per line, and conveniently scan up and down the list.

To get a screen form right with minimum trouble, first design the screen on suitable layout paper, including all input fields at maximum length. When programming the screen form in Basic make maximum use of CD\$, Spc, and Tab. The whole thing should be displayed in low intensity, if you have it, so that the input data itself may be highlighted and selectively cleared using CH\$, without having to redraw the

(continued on next page)

LISTING 3

```
10040 B$ = CHR$(31)+CHR$(130): BB$="" : FOR J%=1 TO 40:
      BB$ = BB$ + B$: NEXT
      'forty flashing asterisks
10050 DEF FNC$(V,H) = E$ + "=" + CHR$(V+31) + CHR$(H+31)
      'position the cursor

310   BM$ = LEFT$(BB$,76 - LEN(M$) AND 126):
      M$ = BM$ + " " + M$ + " " + BM$:
      PRINT HM$FNC$(24,1)CUP$M$HM$;: RETURN
```

LISTING 4

```
Sirius:
320   PRINT E$"Y8!"SPACE$(78)HM$: M$="" : RETURN
Xerox:
320   PRINT HM$FNC$(24,1)CUP$SPACE$(78)HM$: M$="" : RETURN

330   PRINT BE$;: GOSUB 310: FOR J%=1 TO 5000: NEXT:
      GOSUB 320: RETURN
      'bell, message, pause & clear.
```

LISTING 5

```
1000 PRINT HM$NC$;           'home & kill the cursor
1010 DEF SEG %HF000         'start of screen memory
1020 BSAVE "NAME.SCR",0,3840 'save 3840 bytes.
1030 PRINT CU$;           'cursor on again
1040 GOTO 1040             'hang here till you see
                              if it's right; ALT-C to
end.
```

LISTING 6

```
100   '***** SCREEN.BAS SCREEN GENERATOR PROGRAM *****
110   '*****   By Jim McCartney Sept 1984   *****

111   '***** DATA and KEY SETTINGS *****
120   E$=CHR$(27): KS$=E$+"4": N$="" : PRINT E$"z";: DEF SEG=%HF000
      'define strings; activate cursor keys; point to screen

130   DATA 49,50,51,69,70,71,90,91,92,72,100 'key numbers
140   DATA 201,203,187,204,206,185,200,202,188,186,205,
      218,194,191,195,197,180,192,193,217,179,196:
      'corresponding ASCII values of line graphics,
      resp. double & single lines.

150   DIM N%(10): DIM S%(1,10) 'arrays for the DATA
160   FOR J%=0 TO 10: READ N%(J%): NEXT
170   FOR K%=0 TO 1: FOR J%=0 TO 10: READ S%(K%,J%): NEXT J%,K%

180   FOR K%=0 TO 1: FOR J%=0 TO 10:
      PRINT KS$CHR$(50+K%)CHR$(N%(J%))CHR$(S%(K%,J%)):
    NEXT J%,K%
      'program the keys accordingly

200   '***** SCREEN DRAWING *****
210   PRINT E$"y5"E$"x1";:
      PRINT E$"Y8! ALT-Z = SAVE ALT-X = LOAD ALT-D = DUMP ALT-C = STOP ";N$
      'activate cursor & prompt on line 25: line 25 is not saved!
220   PRINT E$"Y(5";: WIDTH 255
      'cursor to mid-screen

230   Q$ = INKEY$: IF Q$="" THEN 230
      'get a character
240   IF Q$=CHR$(26) THEN 300 'save it
250   IF Q$=CHR$(24) THEN 400 'load a file
260   IF Q$=CHR$(4) THEN 500 'dump it to printer
270   PRINT Q$;: GOTO 230
      'print it & go again.

290   '***** SAVE, LOAD, AND DUMP *****
300   PRINT E$"Y8!"E$"1 Name of screen to save : ";:
      LINE INPUT N$: N$ = N$ + ".SCR":
      PRINT E$"x5"E$"H";: BSAVE (N%),0,3840: GOTO 210

400   PRINT E$"Y8!"E$"1 Name of screen to load : ";:
      LINE INPUT N$: N$ = N$ + ".SCR":
      BLOAD (N%),0: GOTO 210

500   FOR J%=0 TO 24:
      FOR K%=0 TO 79:
          A = PEEK (2*K% + 160*J%):
          IF A<100 THEN A$=" "
          ELSE A$=CHR$(A-100)
510   LPRINT A$;:
      NEXT K%:
      LPRINT:
      NEXT J%:
      GOTO 210
```

(continued from previous page)

screen form. The form then needs to be drawn only once, and can be coded at the appropriate place in the program.

If you have several elaborate screen formats, which may include boxes or rulings for clarity, not to mention a few menus and some text pages, you may find they take up a good deal too much program space. In such a case you may be able to BLoad the screen directly from disc into the screen memory map. This command is available in MSBasic on the Sirius, although there is no mention of it in the manual, and at the last check the compiler did not recognise it. BLoading the screen is slower than drawing it in Basic, but if you have your screen forms on a hard disc the delay is hardly noticeable. You can also store as many screens as you like including, if the program merits it, an elaborate Help structure.

The simplest form of screen generator is a short Basic program which first draws the screen frame, and then terminates with something like listing 5. You can hack around with this routine until you get a screen to please you, and save the program for future screen editing. The resulting screen may be brought into the program with the line

```
PRINT CL$; DEF SEG &HF000:
BLOAD "NAME.SCR",0
```

It is not actually necessary to clear the screen first, but it looks tidier in action.

The next level of sophistication is to write your own screen generator. This is really very simple if you know your way round the machine, and a program for the Sirius is given in listing 6. The first section amends the numeric keys in such a way that they print the various components of the screen boxes: Alt plus a number gives single lines, and Shift plus a number gives double lines. The arrangement of keys is shown in figure 1.

Use the cursor controls to move the cursor anywhere on the screen, and type in the text and characters

TABLE 2. DATA PARAMETERS

L%	Maximum length of field
V%	Vertical screen position
H%	Horizontal screen position
LL	Lower numerical limit, or least length of string
UL	Upper numerical limit
TF%	Data type*
DP%	Number of decimal places
WN\$	Warning string: message if data is not validated
IN\$	The input string itself

*Data type: 1 for single-precision numbers; 2 for double-precision numbers; 3 for integers; 4 for strings; 5 for dates; 6 for special validation.

LISTING 7

```
10100 J%=6:
DIM LX(J%), V%(J%), HX(J%), LL(J%),
UL(J%), TF%(J%), DP%(J%), WN$(J%), IN$(J%)

11000 '***** DATA DICTIONARY *****
11010 DATA 8,3,6,5,0,4,0,"Must be 5 to 8 characters long!": 'key
11020 DATA 35,7,6,4,0,4,0,"Must be over 4 characters long!": 'name
11030 DATA 30,8,6,0,0,4,0,"": 'addr.1
11040 DATA 30,9,6,0,0,4,0,"": 'addr.2
11050 DATA 30,10,6,0,0,4,0,"": 'addr.3
11060 DATA 2,14,6,1,30,3,0,"Area codes are 1 to 30": 'sales area

11990 FOR J%=1 TO 6:
READ LX(J%), V%(J%), HX(J%), LL%(J%),
UL%(J%), TF%(J%), DP%(J%), WN$(J%):
NEXT
```

LISTING 8

```
1000 '***** SCREEN FIELD INPUT *****
1020 J% = SF% 'SF% = starting field number
1030 IF J% < SF% THEN J% = SF% 'don't step back beyond it
1040 GOSUB 290 'position the cursor
1050 A$ = "": L% = 0 'temp input string, length counter
1060 Q% = ASC(INPUT$(1)) 'get a character
1070 IF Q% = 13 AND L% = 0 THEN Q% = IN$(J): L% = LEN(Q$): GOTO 1220 'accept existing input string
'proceed to validation
1080 IF Q% = 13 AND L% > 0 THEN 1200
1090 IF Q% = 27 AND L% = 0 THEN J% = J% - 1: GOTO 1030 'step back a field
'back to start of this field
1100 IF Q% = 27 AND L% > 0 THEN 1040
1110 IF Q% = 8 AND L% = 0 THEN 1060 'do nothing
1120 IF Q% = 8 AND L% > 0 THEN L% = L% - 1:
A$ = LEFT$(A$,L%): PRINT CHR$(8);: GOTO 1060 'backspace
1130 IF Q% > 241 AND L% = 0 THEN RETURN 'Exit if function keys are used
1140 IF Q% < 32 THEN 1060 'ignore other ALT characters
1150 IF Q% > 96 THEN Q% = Q% - 32 'convert letters to upper case
1160 Q$ = CHR$(Q%): PRINT Q$;: A$ = A$ + Q$: L% = L% + 1 'concatenate the result
'get another character, ELSE:
1170 IF L% < L%(J%) THEN 1060
1180 Q% = ASC(INPUT$(1)):
IF Q% = 13 OR Q% = 27 OR Q% = 8 THEN 1070 ELSE 1180 'dump any input after field end

1200 Q$ = LEFT$(A$,L%) 'cut off at L%
1220 ON TF%(J%) GOTO 1300,1400,1500,1600,1700,1800 'branch to validation, according to field type.
```

you want. If you scroll off, you will save only what is visible. The facilities Bright, Reverse and Underline are all available. Screen names should not exceed eight characters.

The data dictionary is part of the Data Division consisting of a Data and Read section where all the input-field data parameters are gathered together. The data parameter values are subscripted variables, J% being used as the field counter. The parameters are shown in table 2.

The coding shown in listing 7 will set up the screen for a simple

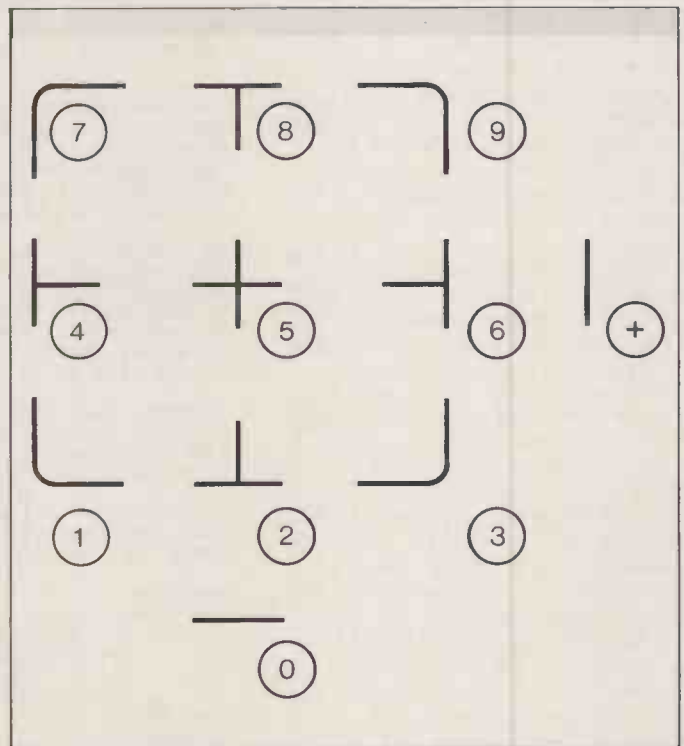


Figure 1. Assignments of numeric keys when used with Sirius screen-generator program.

LISTING 9

```

DATA DICTIONARY:
10060 Z$ = "000000" 'as many trailing zeroes as you need
10070 DIM Q$,DP%,TP,P%,D% 'temp fp value, no.of decimals, powers of ten,
                             position of decimal point, decimals in string
10080 RUE = .00000001 'a round-up add-on with more zeroes than Z$

SUBROUTINE:
400 DP% = DP%(J%)
405 Q$ = VAL(Q$):
    IF Q$ <> 0 THEN TP = 10^DP%:
        Q$ = FIX(Q$ * TP +.5)/TP + RUE
        Q$ = MID$(STR$(Q$),2)
        ELSE Q$ = "0"
'round to DP% places and put in string
410 P% = INSTR(Q$,"."):
    IF P%=0 THEN Q$ = Q$ + "." + Z$: GOTO 410
        ELSE D% = LEN(Q$) - P%:
            IF D% < DP% THEN Q$ = Q$ + Z$: GOTO 410
'P% is position of decimal, and D% the no. of places
it. If there isn't a decimal, make one. Add zeroes if needed.
420 IF D% > DP% THEN IF DP% THEN Q$ = LEFT$(Q$, P% + DP%)
        ELSE Q$ = LEFT$(Q$, P% - 1)
'remove spare decimals
430 IF Q$ < 0 THEN Q$ = "-" + Q$ 'minus sign if needed
440 IF LEN(Q$) < L%(J%) THEN Q$ = SPACE$(L%(J%) - LEN(Q$)) + Q$
'add leading spaces to justify on decimal point
450 RETURN

```

LISTING 10

```

1300 GOTO 1400 'treat s.p as d.p
1400 GOSUB 400
1410 IF Q$ < LL(J%) OR Q$ > UL(J%) THEN 1900 ELSE 2000

```

1900 rejects, and 2000 accepts: see below.

LISTING 11

```

1500 Q% = VAL(Q$)
1510 IF Q% <> VAL(Q$) THEN 1900 'reject non-integers
1520 IF Q% < LL(J%) OR Q% > UL(J%) THEN 1900 'outside range
1530 IF Q% > -1 THEN Q$ = MID$(STR$(Q%),2)
        ELSE Q$ = STR$(Q%) 'remove leading space
1540 IF LEN(Q$) < L%(J%) THEN Q$ = SPACE$(L%(J%) - LEN(Q$)) + Q$
        'right justify
1550 GOTO 2000

```

LISTING 12

```

1600 IF L% >= LL(J%) THEN
Q$ = LEFT$(Q$ + SPACE$(40),L%(J%)): GOTO 2000 ELSE 1900
'ensure string is minimum length and pad right with spaces.

```

LISTING 13

```

DATA DIVISION:
10090 MD$ = "JanFebMarAprMayJunJulAugSepOctNovDec"
10100 C% = 100
10110 DIM DD%,Q1%,Q2%,Q3% 'date integer, ints. used in date validation

10500 DEF FND$(DD%) = RIGHT$("0" + MID$(STR$(DD% MOD C%),2),2)
        + " " + MID$(MD$,((DD%\C% - 1) MOD 12) * 3 + 1, 3)
        + " " + MID$(STR$(1980 + (DD%\C% - 1) \ 12),2)
        'converts integer date to DD Mon YYYY
10510 DEF FN$(DD%) = RIGHT$("0" + MID$(STR$(DD% MOD C%),2),2)
        + RIGHT$("0" + MID$(STR$(DD%\C% - 1) MOD 12 + 1),2),2)
        + MID$(STR$(80 + (DD%\C% - 1) \ 12),2)
        'converts integer date to input format DDMYY

VALIDATION PROCEDURE FOR DDMYY AND CONVERT TO INTEGER:

1700 IF LEN(Q$) <> 6 THEN 1900

1710 Q1% = VAL (LEFT$(Q$,2)):
Q2% = VAL (MID$(Q$,3,2)):
Q3% = VAL (RIGHT$(Q$,2))
'resp DD, MM, and YY

1720 IF Q1% < 1 OR Q1% > 31
OR Q2% < 1 OR Q2% > 12
OR Q3% < 80
OR ((Q2%=2 OR Q2%=4 OR Q2%=6 OR Q2%=9 OR Q2%=11)
AND Q1%=31)
OR (Q2% = 2 AND Q1% = 30)
OR (Q2% = 2 AND Q1% = 29 AND (Q3% MOD 4 > 0)) THEN 1900

1730 DD% = Q1% + Q2% * C% + (Q3% - 80) * C% * 12:
GOSUB 320: GOSUB 290: PRINT HI$FND$(DD%)LO$: GOTO 2020
'calculate the integer and display the full date.

```

name and address file. Though it is handy to use a variable to save time if you change the program, the compiler does not like it in an array declaration. If you have several input screens in the same program, just extend the Data section, leaving a few spaces with null data in case you want to add more fields. For example, Customer input may be in the range of J% equal to 1 to 16, and Product input in the range 20 to 28. For J% equal to 17, the data is

```
11170 DATA 0,0,0,0,0,0," "
```

Note the line numbering scheme in the Data Dictionary, which helps you to remember which J% you are on. The input parameter values are now all tidily grouped in one place where they can be quickly found, identified and amended.

It is also possible to store the data dictionary on disc. If you do this, and use only a single screen stored on disc in the program, with one or two minor additions the remaining program becomes a shell you can use to enter any set of data with its appropriate screen. If you want to do this, the first program you should write is a program for inputting data dictionaries and filing them on disc. Combined with the screen generator given above, and the shell program, you will now have your first home-made applications generator for input programs.

The input procedure functions as follows. One character is input at a time, and concatenated to make an input string. All data is handled in string form. Numerics are converted for validation, and then converted back to strings.

If the cursor is at the start of a string input field, then Return (CHR\$(13)) accepts any already existing value of IN\$(J%), validates it, prints the string in high intensity, and moves the cursor to the next field. Escape (CHR\$(27)) steps the cursor back to the start of the previous field, until J% is equal to SF%, the start field number. Backspace (CHR\$(8)) does nothing. Specified control characters will exit from the subroutine. Any printable character is accepted as the first string character and printed, and the cursor moves right.

If the cursor is within a field, then Return terminates the string at the cursor position, and proceeds to validation. If validated, the string is reprinted in high intensity, and the cursor moves to the next field. Escape moves the cursor to the start of the field. Backspace steps the cursor back through the field. Specified control characters do nothing. Any

(continued on next page)

LISTING 14

```

1900 PRINT BE$;: M$=WN$(J%): GOSUB 310: GOTO 1040
      'display warning and try again

2000 GOSUB 320                      'delete any message
2010 GOSUB 290: PRINT HI$Q$LO$;    'print accepted string bright
2020 IN$(J%) = Q$                    'store it in array
2030 IF J% < EF% THEN J% = J% + 1: GOTO 1040
      'if J% is less than EF% (end field) goto next field
2040 Q% = 0: RETURN

```

LISTING 15

```

20000 SF% = 1: EF% = 6                'start & end
20010 PRINT CL$: DEF SEG &HF000: BLOAD "CUSTOM.SCR", 0 'screen form
20020 GOSUB 1020                      'input data
20030 IF Q% = 0 THEN 20040 ELSE ... (program appropriate action for control
keys)

20040 GOSUB 500                      'get OK from operator.
20050 IF Q$ = "N" THEN GOSUB 600: GOTO 20020 'go back and edit it
20060 ..... (proceed with filing, or whatever you want to do to it !)

```

SUBROUTINES:

```

500 M$ = "Are you sure this is all OK? Key Y or N":
    GOSUB 310: PRINT NC$;: Q% = ASC(INPUT$(1))
510 IF Q% > 96 THEN Q% = Q% - 32      'if lower case
520 IF Q% <> 78 AND Q% <> 89 THEN 500 'N or Y
530 Q$ = CHR$(Q%): PRINT CU$;: GOSUB 320: RETURN

600 PRINT CH$;:
    FOR J% = SF% TO EF%:
        GOSUB 290:
        PRINT IN$(J%):
    NEXT:
    RETURN
    'clear high intensity and reprint data low intensity for edit

```

(continued from previous page)

printable character is concatenated to the string, and printed in low intensity. The cursor moves right.

If the cursor has passed the maximum field length, all keyboard input is ignored except Return, Escape and Backspace, which act as though the cursor is within a field.

Listing 8 is written for clarity rather than efficiency. Line 1130 allows an exit on any Sirius function key; other machines may use other functions. For example, Ctrl-E is CHR\$(5) and could be used for Exit to Menu, etc. Line 1150 is optional; it converts all alpha characters to upper case, so that strings are matched regardless of capitalisation.

Note also that Input\$(1) is preferred to the Inkey\$ function, as it is tidier, and although Inkey\$ compiles, it works very badly when compiled. For older machines like the Commodore or Apple, you have to Peek various locations in

order to get the input character.

This procedure can be further elaborated to backspace and amend a character within a string, without curtailing the string at the cursor position. This is useful for inputting long strings, but the procedure described is sufficient for most purposes.

Floating-point numbers, when converted by the validation procedures from strings to FP form, have a nasty habit of coming up with several spurious decimal places, like 8.599999999 for 8.6. It is therefore best to treat them as strings for all input purposes. The subroutine in listing 9 rounds a number in string format to a specified number of decimal places.


Single-precision and double-precision numbers can in most cases be treated in the same way: the validation is now simply as in listing 10. Line 1900 rejects and line 2000 accepts. Integers may be string formatted more simply, as in

listing 11, and strings are easily tested, as in listing 12.

Dates need special treatment. First of all, operators find it a great deal faster to enter the date in the format DDMMYY — 011084 for 1st October 1984 — if there is a lot of it to be done. However, the display is much easier to read if it is in the format DD Mon YY — 01 Oct 84 or 01 Oct 1984. Also, the date is most economically stored on disc as an integer, which takes only two bytes.

You can convert to integers in various ways; one way is to calculate the number of days from, say, 1st Jan 1980, to the date entered. This makes subsequent calculations based on date difference very simple. A quicker method is to work out the months from 1980, multiply by 100 and add the days. The necessary functions and the validation procedure are given in listing 13. Note that the expanded date is printed on the screen.

Lines 1800 to 1899 are reserved for the validation of functions which fall into none of the categories already mentioned, and require special programming. To finish off the validation procedure use the code shown in listing 14. This subroutine will be in operation while J% is equal to or between SF% and EF%, the starting and finishing fields, so it is necessary to call it only once for the entire screen. If there is only a single value to be input — for example in some subsidiary operation — then set EF% equal to SF%. The value of Q% will be returned as zero unless there is a breakout using the function keys at 1130.

The input driver to call the validation subroutine is now very easy to specify, as in listing 15. If the data is re-presented in low intensity for editing, each field will be changed to high intensity as it is accepted so the operator can see exactly what is going on. 

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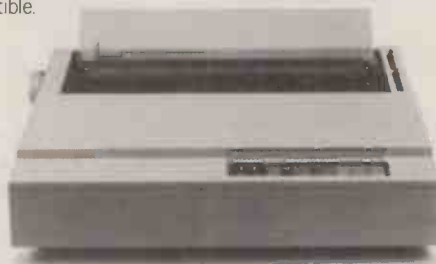
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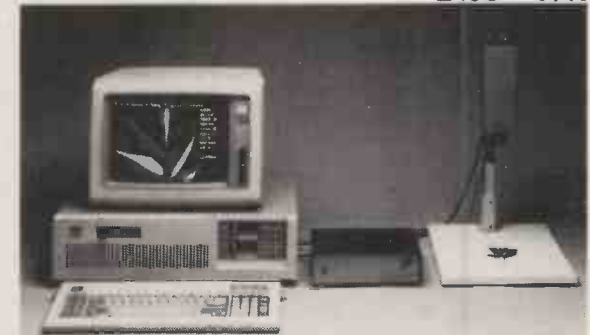
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ALTERNATIVE CURSORS

John Lee, Timothy Lee and C Phillips explain how they exchanged their flashing underline cursor for one which is easier to see on a screen full of text.

USERS of the IBM PC computer and its numerous clones may have noticed that the operating system produces a flashing underline symbol as the cursor on the screen. This does not show up very well, particularly with lower-case letters, which is important when word processing.

The cursor is produced by the graphics chip, so cursor attributes like the rate of flashing — or whether it flashes at all — and the size of the cursor are set by software. In principle it should be possible to reset the relevant parameters to other values. Some proprietary programs seem able to do this, since for example *Basica* has the usual flashing underline cursor in text mode, Screen 0, and a block cursor with graphics modes Screen 1 or Screen 2. In practice, there are great difficulties in changing the cursor. Programs which display a different cursor do so by turning off the system cursor altogether, and producing their own.

We have been looking for an easy way to produce a different cursor, and came up with a small machine-code program which, when run, produces a flashing block cursor rather than the usual flashing underline. This is much easier to see. The program has been tested on IBM PC and Advance 86 computers. The steps involved are set out in detail, so that even absolute beginners need not be afraid of machine-code programming, and should be able to make the program work first time.

Step 1. Boot the system as usual. Format a new disc in drive B: and copy the operating system on to it, with the command

```
FORMAT B:/S
```

Step 2. Next copy the program *Debug.Com* from the master disc to the disc in drive B: using the command

```
COPY DEBUG.COM B:
```

Step 3. When writing in machine code it is all too easy to do something wrong, and this could corrupt the disc you are using. The precautions in steps 1 and 2 are to safeguard against this. Now remove the master disc from drive A:, move the new disc from drive B: to drive A:, and reboot the system by pressing Control, Alt and Del together.

Step 4. Load the *Debug* program by typing

```
DEBUG
```

and pressing Enter. Then type

```
N CURSOR.COM
```

to create a new file called *Cursor.Com*. Then type the following string of characters exactly, including the spaces. Be careful to distinguish between capital O and zero (0), and between capital I and number 1; the code contains numbers 0 and 1, not letters O and I

```
E100 B4 01 B9 0F 00 CD 10 CD 20
then press Enter. You have in fact
typed nine bytes in hexadecimal
code, starting at location E100.
Now type
```

```
RCX
```

and press Enter. The system replies

```
CX 0000
```

and gives the prompt

Type 9 and press Enter, since there were nine bytes, and the system replies with the underline prompt. Type W and press Enter to write the file to disc. The system replies

```
Writing 0009 bytes
```

Type Q and press Enter to quit from the *Debug* program. This returns control to the operating system, and you should get the usual A> DOS prompt.

Step 5. If you are interested, you can load *Debug* again and use it to look at the program you have just written. The U option disassembles the program, and then displays the program in mnemonics as well as hex. The Q quits from *Debug* and returns to the system. Try

```
DEBUG CURSOR.COM
```

and press Enter

```
U
```

and press Enter, and

```
Q
```

and press Enter.

Step 6. You may run the program at any time when the system prompt A> or B> is on the screen simply by typing

```
CURSOR
```

and pressing Enter. The cursor will immediately change from an underline to a block.

Step 7. Finally, keep the new disc in drive A:, put the system disc into drive B: and copy the *Cursor* program on to the system disc by typing

```
COPY CURSOR.COM B:
```

If after booting the system, the *Cursor* program is run to give a block cursor, when *WordStar* is run it retains the new cursor. Running *Basica* resets it.

For those interested in the technicalities behind the program, this is what *Cursor* does. In mnemonics the machine code reads

```
MOV AH,01
MOV CX,000F
INT 10
INT 20
```

The *Int 10* instruction causes a software interrupt to a location in the BIOS software. Different *Ints* from *Int 0* through to *Int 1F* jump to different places in the BIOS. The code for *Int 10* deals with the video input/output system. By calling *Int 10* it is possible to change a variety of items relating to the video system. To specify which item to change a value is

placed in the high eight bits of the A register, that is AH, in this case

1. The options are typically
0. change the screen mode
1. change the cursor type
2. set the cursor
3. read the cursor
4. read the light-pen
5. select current page display
6. scroll up
7. scroll down
8. read character under cursor
9. write character under cursor
10. write character under cursor
11. set palette
12. write pixel
13. read pixel
14. write Teletype
15. get video status

Within option 1 the type of cursor required must be specified by setting the value of CX. CX comprises 16 bits, and is made up of CH, the high eight bits, and CL, the low eight bits. Bits 4 to 0 of CH define the start line for the cursor, and bits 4 to 0 of CL define the end line for the cursor. Line 0 of the cursor is the top line of pixels, line 1 is the line below that, line 6 is the bottom line used by most characters, and line 7 is below that.


Some examples of different cursors and the corresponding values of CX are shown in figure 1 next to a letter X. For the first one, where CX is equal to 0007, 00 means stop at line 0 and 07 means stop at line 7. The last two cursors illustrate how a split cursor can be obtained by specifying the start line, CH, greater than the stop line, CL. 

FIGURE 1. ALTERNATIVE CURSORS

		0007	0001	0003	0404	0407	0601	0700
LINE								
0	* *	*****	*****	*****			*****	*****
1	* *	*****	*****	*****			*****	
2	* *	*****		*****				
3	*	*****		*****				
4	*	*****			*****	*****		
5	* *	*****				*****		
6	* *	*****				*****	*****	
7		*****				*****	*****	*****

SPRITE MOVER

THIS IS the second part of a two-part suite of programs by Jon Abbott dealing with sprites on the graphics screen. In *PC*, June, we published the sprite definer code *Sprite-Des*, and now we have the *Sprite Mover*.

The machine code starts at address &2C00 and is intended to be accessed by

CALL &2C00,SPRITE%

where *Sprite%* is any integer variable. *Sprite%* is a hexadecimal number of the form &SC: S is the sprite number in the range 0 to 7, and C is the clone number in the

range 0 to 3, so &21 represents sprite 2, clone 1.

On entry, the code expects certain values to be in A%, X% and Y%. X% and Y% are the coordinates of the sprite in pixels from the top left of the screen. X% is the range 0 to 51 and Y% is in the range 0 to 247.

The value of A% defines the action to be taken. When it is 0 the program moves the sprite; X%,Y% contain the distance to move in pixels from current position. When A% is equal to 1 the sprite is plotted at X%,Y%. A% equal to 2 deletes the sprite.

If there is no *Sprite%* parameter, an error message will be displayed. The code first identifies the pattern number, then gets the address of that pattern. If the action is Plot or Delete it does this and alters the table of X,Y coordinates. If the action is Move, it deletes the sprite then plots it at the new position.

The main work of the program is in SPR2. This set of routines transfers the sprite data to screen, taking into account the screen line boundaries, and crossing them when the need arises. The program was written to run under Basic 2, OS1.2.

The demo program shows how sprites are manipulated on-screen.

Clones work by taking the pattern from the master and reproducing it at clone X%,Y%.

To get the demo program working, define sprite 1 with a particularly ferocious appearance then save it as *Samples*. When you run the demo program two clones will chase you about the screen. To move, use Z, X, : and / for Left, Right, Up and Down.

The designer has to be run from &E00 and tape if you don't happen to have any sideways RAM, and ST10E00 for disc. To run it from disc, load into 1900 then relocate to E00. Also change line 3210 in the designer program to set P% to &900 instead of &D02, if you have discs.

SPRITES

```

10  MODE7
20  HIMEM=&2C00
30  screen = &70
40  screenhi = &71
50  sprite = &72
60  spritehi = &73
70  scrnlo = &74
80  scrnhi = &75
90  size = &76
100 action = &77
110 xco = &78
120 yco = &79
130 temp = &7A
140 temp2 = &7B
150 tempy = &7C
160 fin = &7D
170 sizetab = &2D68
180 addrtab = &2D70
190 xy = &2D80
200 mult = &2DC0

210 FOR pass%=0 TO 2 STEP 2
220 PX=&2C00
230 [opt pass%
240 sta action \ save re
gisters
250 stx xco
260 sty yco
270 lda &600 \ check n
o. of parameters
280 cmp #1
290 beq ok
300 brk \ cause e
rrior
310 EQUB 45
320 EQU$ "1 parameter"
330 brk
340 .ok \ get par
ameter
350 lda &601
360 sta temp
370 lda &602
380 sta temp2
390 ldy #0
400 lda (temp),Y

410 pha
420 lsr A \ get spr
ite no.
430 lsr A
440 lsr A
450 lsr A
460 tax

470 lda sizetab,X \ and siz
e
480 sta size
490 txa
500 asl A
510 tax
520 lda addrtab,X \ and add
ress
530 sta sprite
540 lda addrtab+1,X
550 sta spritehi
560 lda action
570 beq movspr
580 pha \ action
is delt/plot
590 lda xco
600 jsr xcalc

610 lda yco
620 jsr ycalc
630 jsr sprin \ print s
hape
640 pla
650 tay
660 pha
670 pha
680 and #&70 \ get xy
co-ords
690 lsr A
700 lsr A
710 sta temp
720 pla
730 and #&3
740 clc
750 adc temp
760 asl A
770 tax
780 cpy #2
790 beq delt
800 lda xco

810 sta xy,X
820 lda yco
830 sta xy+1,X
840 rts
850 :
860 .delt
870 lda #0 \ or 0 if
delt
880 sta xy,X
890 sta xy+1,X
900 rts
910 :

920 .movspr
930 pla
940 pha
950 and #&70 \ get xy
coords
960 lsr A
970 lsr A
980 sta temp
990 pla
1000 and #&3

1010 clc
1020 adc temp
1030 asl A
1040 pha
1050 tax
1060 lda xy,X \ delete
existing shape
1070 jsr xcalc
1080 lda xy+1,X
1090 jsr ycalc
1100 jsr sprin
1110 pla
1120 tax
1130 lda xy,X \ alter x
y coords
1140 clc
1150 adc xco
1160 sta xy,X
1170 jsr xcalc \ print a
t new position
1180 lda xy+1,X
1190 adc yco
1200 sta xy+1,X

1210 jsr ycalc
1220 jmp sprin
1230 :
1240 .xcalc
1250 ldy #0
1260 sty screenhi
1270 and #&FE \ x is ev
en
1280 asl A \ x*8
1290 rol screenhi
1300 asl A
1310 rol screenhi
1320 sta screen
1330 lda #&30 \ + start
of screen
1340 adc screenhi
1350 sta screenhi
    
```

```

1360 rts
1370 :
1380 .yalc
1390 pha
1400 and #7
fset into screenline

1410 sta temp
1420 sta temp2
1430 pla
1440 and #&F8
gives..
1450 lsr A
1460 lsr A
1470 tax
1480 lda mult,X
into 640x table
1490 adc screen
stored x-contribution
1500 sta screen
1510 sta scrnlo
1520 lda mult+1,X
1530 adc screenhi
1540 sta screenhi
1550 sta scrnhi
1560 rts
1570 :
1580 .spr2

1610 .exch
1620 ldy tempy
1630 lda (sprite),Y
om sprite
1640 ldy temp2
1650 eor (screen),Y
1660 sta (screen),Y
en
1670 inc temp2
1680 inc tempy
1690 lda temp2
of screenline?
1700 cmp #8
1710 bne s1
1720 clc
add &280 to start of line address
1730 lda #&80
1740 adc screen
1750 sta screen
1760 lda #2

1770 adc screenhi
1780 sta screenhi
1790 lda #0
1800 sta temp2
\ offset
into screenline=0

1810 .s1
1820 lda tempy
sprite?
1830 cmp fin
1840 bne s2
1850 rts
1860 :
1870 .s2
1880 and #7
\ bottom
of sprite line reached?
1890 bne exch
1900 lda scrnlo
move top of screenline
1910 clc
\ pointer
on by 8
1920 adc #8
1930 sta scrnlo
1940 sta screen
1950 lda scrnhi
1960 adc #0
1970 sta scrnhi
1980 sta screenhi
1990 lda temp
2000 sta temp2

2010 bcc exch
\ do next
byte
2020 :
2030 .sprin
2040 ldy #0
2050 sty tempy
2060 lda #32
2070 sta fin
2080 jsr spr2
\ print 1
8x8 sprite
2090 bit size
\ is it a
big one?
2100 bmi big
2110 rts
2120 :
2130 .big
\ Yup! at
ter pointers, print bottom half
2140 lda #64

2150 sta fin
2160 lda scrnlo
2170 clc
2180 adc #&68
2190 sta scrnlo
2200 sta screen
2210 lda #2
2220 adc scrnhi
2230 sta screenhi
2240 sta scrnhi
2250 jmp spr2
\ all done !
2260 ]
2270 NEXT
2280 OSCLI"SAVE SPRIOBJ 2C00 2D5D
"
2290 END

SPRITES DEMO
10 REM - Simple demo of sprite code
20 REM - (C) Jon Abbott 1984
30 MODE7:HIMEM=&2C00
40 *L.SPRIOBJ
50 *L.samples
60 MODE2:HIMEM=&2C00
70 VDU23;8202;0;0;0;
80 AX=1:XX=0:YX=0:RX=&10:CALL &2C00,RX
90 XX=151:YX=247:SX=&11:CALL &2C00,SX
100 XX=0:YX=247:TX=&12:CALL &2C00,TX
110 BX=0:CX=0:DX=151:EX=247:FX=0:GX=247
120 AX=0
130 REPEAT
140 XX=4*(INKEY(-98)-INKEY(-67))
150 YX=4*(INKEY(-73)-INKEY(-105))
160 IF (XX&ORYX)CALL&2C00,RX:BX=BX+XX:CX=CX+YX
170 XX=2*((DX>BX)-(DX<BX))
180 YX=2*((EX>CX)-(EX<CX))
190 IF (XX&ORYX)CALL&2C00,SX:DX=DX+XX:EX=EX+YX
200 XX=3*((FX>BX)-(FX<BX))
210 YX=3*((GX>CX)-(GX<CX))
220 IF (XX&ORYX)CALL&2C00,TX:FX=FX+XX:GX=GX+YX
230 UNTILFALSE
    
```

LINE-NUMBER STRIPPER

IF YOU have ever tried to read a spooled program into a word processor and use it there you will appreciate this utility from K Penton. It intercepts the main


output routine and causes the first five characters of each line to be ignored. The effect of this when listing a Basic program is to remove the line numbers.

The *Spool command in the Key 0 definition produces a text file that a word processor may read

to move around blocks of lines such as procedure definitions, in order to tidy up a working program.

To use the line-number stripper, first run the program. Load the Basic program to be edited and press f0. This will Spool a text file

of the program without line numbers, and with Auto as its first line.

Enter the word processor and do the required editing, then save the file to tape or disc. It can then be executed to produce the final Basic program with line numbers. 

LINE-NUMBER STRIPPER

```

20 REM Line-numberless spool
30 REM -----
40 REM K Penton 1984
50 REM -----
60 FOR J% = 0 TO 1
70 P%=&c00
80 EOPT J%*3
90 .initialise
100 LDA VECTOR \ swap WRCHV and
110 PHA \ address of the
120 LDA &20E \ line-number
130 STA VECTOR \ stripper
140 PLA
150 STA &20E
160 LDA VECTOR+1
170 PHA
180 LDA &20F

190 STA VECTOR+1
200 PLA
210 STA &20F
220 LDA #&FF \ initialise coun
t
230 STA FLAG
240 RTS
250
260 .lstrip
270 CMP #&0D \ new line?
280 BNE flagtest
290 LDA #&04 \ for 5 chars
300 STA FLAG \ to strip
310 LDA #&0D \ do the return
320 .NORM
330 JMP (VECTOR)
340 .flagtest

350 BIT FLAG \ ignore char?
360 BMI NORM \ past first 5
370 DEC FLAG
380 RTS
390
400 .VECTOR
410 EQUW lstrip
420 .FLAG
430 EQUW 0
440 ]
450 NEXT
460
470 *FX225,1
480 *K.0 CA.&C00|M *SP.TEMP|M REM
AUTO|M LI.|M*SP.|M CALL&C00|M
    
```

SIMULTANEOUS EQUATIONS

THE PROBLEM of solving simultaneous equations, even those with complex parts, is one faced in many mathematically-based disciplines. Viktor Kesler has proffered a two-part program for doing this on the PC-1500.

Simeq works by the Gaussian method of elimination, and noughts are allowed on the main diagonal. Also, for greater accuracy Simeq will swap rows to get larger numbers on to the main diagonal of the system. Error 38 will appear if the system is undefined or contradictory. Error 10 appears right at the start if there is not enough memory for the desired order. With the 8K module there is room for a 30-by-30 system.

An example for Simeq is to solve the following:

$$2x_1 + 2x_2 - 2x_3 + 4x_4 = 16$$

$$x_1 + 2x_2 + x_3 + 2x_4 = 16$$

$$-2x_1 + x_2 + 2x_3 + x_4 = 10$$

$$2x_1 - x_2 - x_3 + x_4 = 1$$

Run Simeq, setting N equal to 4, the order of the system, and entering the following values:

```
A(1,1)=2
A(1,2)=2
A(1,3)=-2
A(1,4)=4
B(1)=16
```

and so on.

The results are displayed in the form

```
X(1)=1
X(2)=2
and so on.
```

If you never need to solve equations containing complex numbers then lines 365 and 410 to 660 can be omitted. But if you do, these invoke Complex, which

SIMULTANEOUS EQUATIONS

```
10:"SIMEQ"CLEAR :
WAIT 0:FL=0
20:INPUT "N=";N:N
=N-1:DIM A(N,N
),B(N)
30:FOR I=0TO N
40:FOR J=0TO N
50:A$="A(" +STR$(
I+1)+"," +STR$(
J+1)+")="
60:PRINT A$;
70:INPU A(I,J):
CLS
80:NEXT J
90:B$="B(" +STR$(
I+1)+")="
100:PRINT B$;
110:INPUT B(I):CLS
120:NEXT I
130:FOR J=0TO N-1
140:FOR K=1TO N-J
150:IF (ABS A(J+K,
J))>ABS A(J,J)
AND (A(J+K,J)<
>0)THEN 190
160:IF (A(J,J)=0
AND A(J+K,J)<
0)THEN 190
170:NEXT K
180:GOTO 230
190:FOR L=JTO N
200:C=(A(J,L):A(J,L
)=A(J+K,L):A(J
+K,L)=C
210:NEXT L
220:C=B(J):B(J)=B(
J+K):B(J+K)=C
230:FOR K=J+1TO N
240:R=-A(K,J)/A(J,
J)
250:FOR L=JTO N
260:A(K,L)=A(K,L)+
R*(A(J,L)
270:NEXT L
280:B(K)=B(K)+R*B(
J)
290:NEXT K:NEXT J
300:FOR J=NTO 1
STEP -1
310:FOR K=J-1TO 0
STEP -1
320:B(K)=B(K)-B(J)
*(A(K,J)/A(J,J)
330:NEXT K:NEXT J:
BEEP 3:WAIT
340:FOR I=0TO N
350:C=B(I)/A(I,1)
360:A$="X(" +STR$(
I+1)+")="
365:IF FLGOSUB 650
370:PRINT A$;C
380:NEXT I:BEEP J:
GOTO 340
390:SD=5:V=SGN C*
INT LOG ABS C:
B=10-SD+V
400:C=C+10*B:C=C-1
0*B:RETURN
410:"COMPLEX"WAIT
0:CLEAR:FL=1
420:INPUT "N=";N:N
=2*N-1:DIM A(N
),B(N)
430:FOR J=0TO N-1
STEP 2
440:FOR I=0TO N-1
STEP 2
450:C$=STR$(I/2+
1)+"," +STR$(J/
2+1)+")="
460:A$="Re(" +C$:B$
="Im(" +C$
470:PRINT A$;
480:INPUT A(I,J):
CLS
490:PRINT B$;
500:INPUT A(I+1,J)
:CLS
510:NEXT I:NEXT J
520:FOR I=0TO N-1
STEP 2
530:A$="Re(" +STR$(
(I/2+1)+")="
540:B$="Im(" +STR$(
(I/2+1)+")="
550:PRINT A$;
560:INPUT B(I):CLS
570:PRINT B$;
580:INPUT B(I+1):
CLS
590:NEXT I
600:FOR I=0TO N-1
STEP 2
610:FOR J=0TO N-1
STEP 2
620:A(I,J,J+1)=-A(I+
1,J):A(I+1,J+1
)=A(I,J)
630:NEXT J:NEXT I
640:GOTO 130
650:IF INT (I/2)*2
=ILET A$="Re("
+STR$(I/2+1)+
")=":RETURN
660:A$="Im(" +STR$(
(I/2+1)+1)+
")=":RETURN
```

works by rearranging a complex matrix of the Nth order into a real matrix of the 2Nth order, which is then solved by Simeq.

An example for Complex might be to solve:

$$(10 - 10i)x_1 + 10ix_2 = -10 + 10i$$

$$10ix_1 + 10x_2 = 10 - 10i$$

Run Complex, setting N equal to 2 and enter the following values:

```
Re(1,1)=10
Im(1,1)=-10
Re(2,1)=0
```

and so on.

The results are displayed in the form

```
Re(1)=-0.8
Im(1)=-0.4
Re(2)=0.6
Im(2)=-0.2
```

where Re means real and Im imaginary. Hence, the actual

result is

$$x_1 = -0.8 - 0.4i, x_2 = 0.6 - 0.2i$$

The subroutine at lines 390 and 400 rounds the result C to a specified number SD of significant digits. In the listing SD is 5; alter it to suit your particular purpose. The routine makes use of the Sharp's own rounding procedure, but since this only affects the 12th digit one has to add, and then subtract, a power of 10.

STRING SORT

DAVID LANE has sent in a string sort for the MZ-80A. The main listing is a Basic loader and tape saver for the machine code in the data statements; the smaller listing enables you to test the sort. Once saved,

the machine code can be loaded from Basic, by returning to the monitor and loading it or from within a Basic program, if you so wish. When on board, the code resides at the top of memory, \$CF00, and can be called into action with a Usr command.

For example, to sort the elements in the string array Fred\$, assign the name of the array to a string variable thus:

```
D$="FRED"
```

and then give a Usr command of the form

```
USR($CF00,D$)
```

The sort is extremely quick, especially to those of us used to the ploddings of Basic. Typically, 100 words averaging six letters are sorted in a second, and even 250 words take under 10 seconds. **KL**

STRING SORT. BASIC LOADER

```
10 REM String-Sort Hex-Loader
20 REM Dave Lane H.B.S.S.
30 LIMIT 52991
40 PRINT"Loading data into memory"
50 S=52992: REM start address
60 C=0: REM checksum counter
70 FOR N=0 TO 162:REM 163 bytes
80 READ H$: REM get hex byte
90 D=0: REM hex to decimal
100 FOR NB=1 TO 2
110 D=D+INT(16^(2-NB))*(ASC(MID$(H$,NB,1))
-48+7*(ASC(MID$(H$,NB,1))>57))
120 NEXT NB
130 POKE S+N,D: REM load into memory
140 C=C+D: REM add to checksum
150 NEXT N
160 IF C<15734 THEN PRINT"Checksum error -
Recheck data.":STOP
170 PRINT"Ready to save to tape...":PRINT
180 S=4336:POKE S,1: REM m/c
190 N$="String-Sort": REM name
200 FOR N=1 TO 11:POKE S+N,ASC(MID$(N$,N,1))
:NEXT N
210 POKE 4348,13
220 POKE 4354,163:POKE 4355,0:REM size
230 POKE 4356,0:POKE 4357,207:REM data
240 POKE 4358,80:POKE 4359,18:REM exec
250 USR(33):REM write tape header
260 USR(36):REM write data
270 END
280 DATA 18,06,00,00,00,00,00,00
290 DATA 1A,32,02,CF,0D,20,04,3E
300 DATA 20,18,02,13,1A,32,03,CF
```

```
310 DATA 2A,90,4E,ED,5B,8E,4E,AF
320 DATA ED,52,44,4D,EB,3A,02,CF
330 DATA ED,B1,7B,B1,CB,3A,03,CF
340 DATA BE,20,F2,23,7E,32,05,CF
350 DATA 23,23,22,06,CF,3E,01,32
360 DATA 04,CF,2A,06,CF,54,5D,46
370 DATA 04,04,13,10,FD,3A,05,CF
380 DATA B7,CB,47,C5,E5,D5,23,13
390 DATA 7E,FE,0D,28,2E,1A,FE,0D
400 DATA 28,05,BE,28,F1,30,24,D1
410 DATA E1,06,00,4E,0C,0C,79,0B
420 DATA E5,D5,11,40,4A,ED,B0,E1
430 DATA D1,4E,0C,0C,ED,B0,08,4F
440 DATA 35,D5,21,40,4A,ED,B0,AF
450 DATA 32,04,CF,E1,D1,54,5D,46
460 DATA 04,04,13,10,FD,C1,10,BB
470 DATA 21,05,CF,35,3A,04,CF,B7
480 DATA 2B,9B,C9
```

TEST PROGRAM

```
10 REM String-Sort demonstration.
20 DIM A$(100)
30 PRINT CHR$(22):"100 random strings..."
40 FOR A=1 TO 100:FOR C=1 TO INT(RND(1)*5+2)
50 A$(A)=A$(A)+CHR$(INT(RND(1)*26+65))
60 NEXT C:PRINT A$(A):NEXT A
70 PRINT"SORTING...":TI$="000000"
80 D$="A":USR($CF00,D$)
90 T$=TI$:PRINT"Finished..."
100 FOR A=1 TO 100:PRINT A$(A):NEXT A
110 PRINT:PRINT"Sorted in ":RIGHT$(T$,2)," sec."
```

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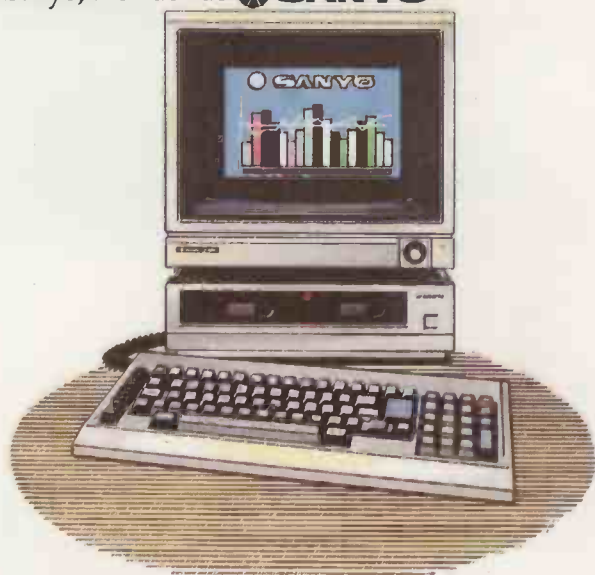
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