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INPUTS AND OUTPUTS

Our special feature looks at the ways in which you can get data in and out of a micro. After an introduction to the subject which sketches in the background to some of the most exciting recent developments, *Simon Beesley* examines the area of visual inputs on page 94. On page 96 *Joanne Bennett* reviews Thunderscan, a cheap and simple input device which turns a printer into a scanner. On the output side, *Steve Gold* explains what's been happening with modems, and gives a comprehensive listing of BT-approved models on page 100.

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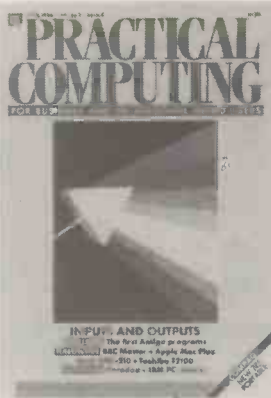


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Every effort is made to check articles and listings but PC cannot guarantee that programs will run and can accept no responsibility for any errors.

JAPAN INC.

Four years ago the Japanese government's Ministry of Trade and Industry set up Icot, the Institute for New Generation Computer Technology. Its task was to develop the so-called fifth-generation computer. The announcement sent shock waves through the Western world. It appeared that Japan was about to forsake its traditional role of a humble if efficient imitator of the West for a more innovative, aggressive one.

The Western response was swift. The Defense Applied Research Projects Agency of the U.S. Department of Defense announced that it would be contributing \$100 billion for research in this area, including work towards a computer for artificial intelligence. Even the British government, not renowned for its generosity, coughed up £350 million to fund the Alvey Project.

Both were typical overreactions. The Japanese programme is very modest: there are only about 40 researchers at the new Icot. There is little danger that huge advances will be made there which will leave the West gasping. Both responses also totally missed the point about the Japanese initiative.

It was a red herring, or in this case, red sushi. The fact that Icot was set up on the 1 April could just be coincidental. Of course, enormous benefits will one day accrue from the type of technology involved in developing the fifth-generation computer. But not for many years yet.

However, the Icot programme has succeeded in concentrating the minds of the West wonderfully, though in the wrong place. It has helped reinforce the delusion that we are better than the Japanese because we are creative whereas they are only productive.

By chasing after glamorous fifth-generation fantasies, the West's computer industry has allowed itself to be deflected from the main task of producing mass-market machines more cheaply and efficiently. As a result the Japanese are set to dominate the world market for micros and computers in the same way they have with TVs, videos, cars and electronic components.

The signs were already there in the Icot initiative. The roll call of the participants reads like a letter of intent: Matsushita, Hitachi, Toshiba, NEC, Mitsubishi, Fujitsu, Sharp and Oki. In this country these are all names that are vaguely familiar in the computer field. In Japan they represent most of the top electrical and electronic manufacturers.

Take Matsushita for example. It is the second-largest company in Japan, with a turnover of around \$20 billion. Yet in the U.K. it is a name that is hardly known. Its subsidiary Panasonic is more familiar, and is likely to become increasingly so in

the next year. In last month's issue we looked at its latest portable micro. This is Panasonic's first new machine for some time, but is unlikely to be the last. In this issue we look at two more micros from Japanese manufacturers Sony and Toshiba which are both likely to be significant machines.

Also in the last issue was a new machine from Epson, a cheap but well-made IBMulator. This category is likely to be particularly crucial. Traditionally the Japanese have waited until a market has stabilised and reached maturity before they enter it and dominate it. The PC market is now ripe for such a conquest. Over the next year we can expect to see a whole flood of very cheap but very high-quality clones.

At the moment computers and electronics taken together represent only about 25 percent to 30 percent of the leading Japanese companies' turnover. There is a tremendous potential for these huge industrial combines to ramp up sales and profits in this sector. That the market is not as saturated as other consumer and industrial fields is an enormous incentive.

Over the last few years we have seen a number of computer giants enter the micro market with great expectations, only to be brought to their knees by adverse fortune. It will be interesting to see how Japan Inc., the latest and perhaps greatest of these titans, fares when it joins the fray in earnest.

5 YEARS AGO...

With reference to the statement in the January 1981 editorial that schools still use punch cards for computing, I would like to point out that many universities and colleges still use them.

It is not totally to do with lack of money, although a major reason, but because, in business computing, punch cards are still the norm. The point is that it is not just computing which needs to be taught in schools but microcomputing.

Schools are just beginning to include computer science in their curricula. Schools should be teaching pupils that computers are common objects which can be small and easy to use, rather than being something large, indistinct and far away in a university and which seem to take two weeks to run a simple program.

Unless microcomputers are used in schools, the two fields of computing, in the sense of business data processing, and personal computing will not merge.

If they succeed and we have a young generation aware of personal computers, the micro revolution will have truly arrived.

Feedback, PC Volume 4 Issue 4

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KEITH BENDON,
Microlise Ltd,
Long Eaton.

Cheap clone purchases

AS MORE cheap IBM PC clones enter the market for ever lower prices, readers may well contemplate buying one. *Practical Computing* will cover those which look particularly interesting, and give guidance on whether they offer value for money.

However, if you decide to buy one on this or any other basis, it is important to bear in mind that the companies which produce or import these machines differ greatly from other micro manufacturers. For example, they may be very young companies, and not fully stable financially. In particular, they can often experience adverse cash-flows in their first few months.

For this reason it is vital that you enter into contracts with such companies even more carefully than when dealing with longer-established firms. Make sure that models are actually available and not just due on the next flight. Do not part with money until you are satisfied with the arrangements. This is to avoid cases where buyers have been left waiting without a machine pending its eventual arrival, and without their money.

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

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A BAD DEAL FOR DEALERS

I READ the editorial in the February edition of *Practical Computing* with feelings that varied from total astonishment to anger.

Astonishment that a reputable computer magazine such as yours is so completely ignorant of the market, and anger because once again the industry, and especially dealers, gets bashed.

The first peculiar point you make is of Osborne's "traumas", as you euphemistically call it. Let's not be mealy-mouthed about it, the man's company went bust for millions of dollars. So why do you raise him to the station of an industry guru? I am sure that the shareholders, creditors and users who cannot obtain spares don't hold him in such high regard as you do.

You comment on the price difference between the PC/AT clones and IBM. While I am sure IBM can fight its own corner are you really recommending people buy from such obscure manufacturers? Tandon is in financial troubles in the States, and who are these manufacturers in Taiwan, etc? Their U.K. distributors are usually small companies with little or no financial backing who will probably find it difficult to provide warranty and service several thousand miles from base working on slim margins.

You comment extensively on the software clones. Have you considered the level of support that the dealer, manufacturer or distributor has to supply? For example, the Borland products seem to be very good but we certainly can only sell them as seen, in the manner of a bookshop. Everyone wants to pay those sort of prices and also wants a manual you can leave open at a page, be able to ask questions, and have bugs fixed free of charge. Well, it can't be done for £50 or even £100. If, for example, you found an error in a cookery book your local bookshop wouldn't want to know, neither would the publisher provide an update. Why is this expected in the computer industry?

Your comments about the dealer's margins are insulting as well as ignorant. We are squeezed between the industry promising the impossible in simple, easy-to-use equipment and the requirement from the customer for maximum service with minimum cost. Our dealership has been established for five years, and while we are profitable we certainly don't make the margins you are suggesting. And what of the bankruptcy rate amongst dealers? At least six medium-sized dealers that I know of have gone in the last few months and there are probably hundreds more smaller dealers going to the wall. You may argue that they were all incompetent, but I think it unlikely. I wish we could make the margin that other retailers do, or even the margin of booksellers.

The final insult is Osborne's quote about getting rid of non-used complexities to make the product so simple it needs no training. This read another way means he will make software so simple it won't do anything. Complex software requires training and support. After all everyone expects to be taught how to drive, a car; why not the same for computers?

D SAUNDERSON,
KGB Micros,
Windsor,
Berkshire.

Protecting against ESD damage

I AM PLEASE to have read Jack Maguire's letter in *Feedback*, December, following my own October letter. Maguire says that ESD should be of concern to personal-computer users, and as a service engineer he clearly knows.

Larry Mascall is one who is concerned — *Feedback*, January — but his inexpensive solution to the ESD problem will not protect his computer, although it may be an effective radiation screen. A PC standing directly on a metal surface is drastically affected by ESD applied to the metal. The mechanism could be by capacitive coupling of the pulsed voltage on the metal surface to the logic circuit board in the base of the computer. Experiments with PCs standing on, say, filing cabinets or metal desks show that damage occurs at 5kV with no earth lead and 2kV with an earth lead fitted.

Electrostatic discharge to an earthed metal surface is very fast at between 0.5 and 20 nanoseconds and can result in shocks to both people and equipment. Voltages in the region of 5kV will cause discomfort to people and damage sensitive electronic devices some of which, for instance CMOS, are vulnerable to voltages as low as 250V.

The optimum protection against direct discharge effects is a static dissipative surface, with conductivity in the range of 10^9 to 10^{10} ohms per square and a decay time constant of the order of a few tenths of a second. Static-Master desk-top pads as produced by this company meet these parameters.

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Tyne and Wear.

On-line services

TO THIS librarian with nine years use of on-line services, Ian Stobie's on-line services article in the February 1986 issue seems to exaggerate their value to non-specialists. Effective searching is not easy, particularly for the casual user. Some systems do try to simplify the process, but systems differ, often radically, in the search techniques used. So it is necessary to be proficient in a

(continued on next page)

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number and to keep up with the continual changes that occur.

Though the average hourly cost of a database is given as £50 it is helpful to know that a typical search is likely to cost at least £20, and often considerably more, depending on the complexity of the subject and the amount of information retrieved. It would have been useful to emphasise the difference between full-text databases and the bibliographic ones that merely provide a list of references to publications which then have to be found in a library — though many services do offer, at a charge, a document-supply service too.

The article rather dubiously seems to suggest that U.S. databases are better and easier to use than European ones. Yet for a business user the U.S. ones are usually too biased to North America and give poorer coverage of European sources and subjects. Similarly, it is surprising that an article discussing databases for business omits those provided by Finsbury Data Services, which include Textline with its comprehensive coverage of 40 British and over 90 overseas newspapers and news services.

Finally, may I point out that not only can technical and business librarians in academic institutions and large public libraries give advice on databases, they will also carry out searches for business, industry or, indeed, anyone who requires information.

IAN WINSHIP,
Polytechnic Library,
Newcastle upon Tyne.

Panasonic transportable

IN OUR review of the Panasonic JB-3300 transportable on page 50 of last month's issue we printed the wrong telephone number. Panasonic's correct number is (0753) 73181.

HP Laserjet competition prize winner

Our laser printer competition in the November and December 1985 issues stumped most of you. We asked you to match the six output samples reproduced below with the printers that produced them.

Of over 700 entries only 12 got the correct answers, which are shown below.

- B Laser — HP Laserjet
- E Ink-jet — HP Thinkjet
- A Thermal transfer — Epson P-80X
- F Standard-mode impact dot-matrix — Canon PW-1080A
- C NLQ-mode impact dot-matrix — Canon PW-1080A
- D Daisywheel — Juki 6100

The better-quality output seemed to cause the most confusion. The most common mistake was to mix up the daisywheel and laser printers. Many people failed to recognise sample A as coming from the thermal-transfer printer, probably because it looked rather better than they expected.

As a tie-breaker we also asked you to come up with a new acronym for the word "laser" to be used in promoting the HP Laserjet. We liked Alan Ali's "Laserjet's Alternatives Stimulate Eventual Regret" as a piece of knocking copy but, regretfully, he got the printers wrong.

Mrs E Childs of Godstone in Surrey came up with "Laserjet's Advantage — Simply Excellent Results" which fitted the bill perfectly. She also got the main task right, so she wins a Hewlett-Packard Laserjet printer. Many thanks to Hewlett-Packard for providing such an excellent prize.

ghijkl ghijkl

A Thermal transfer — Epson P-80X

B Laser — HP Laserjet

ghijkl ghijkl

C Impact matrix printer in NLQ mode — Canon PW-1080A

D Daisywheel — Juki 6100

ghijkl ghijkl

E Inkjet — HP Thinkjet

F Impact matrix printer in standard mode — Canon PW-1080A

Boogie and MS-DOS

BOOG, a source of help, advice and shoulders to cry on for some 700 users of Osborne 01s and Executives working under CP/M, is taking MS-DOS under its wing. The compatible IBM-alike PC brought out by Future Management Ltd — once Osborne U.K. — has encouraged Boog members to expand into the 16-bit field.

Now that Future Management has withdrawn support for Osborne 01s and Executives, Boog is supporting people with these machines even more enthusiastically. Services to Boog members include national and local meetings, a library of public-domain software, a journal called *Boogie* and a newsletter.

Boog has set up a register of people who have an Osborne for sale. Anyone interested in buying a second-hand Osborne should contact the Boog secretary. The service is free to members, £5 to non-members with a reduction in membership fee if you later join Boog. Annual membership costs £18.

JEREMY BROWNE,
British Osborne Owners Group,
102A Aldershot Road,
Fleet,
Hampshire GU13 9NY.

Yearbook prices

IT WAS really good to see *The Software Users' Year Book* mentioned on page 13 of the March issue of *Practical Computing*. The pricing is, however, as follows: Microvolume, £47.20; Mainframe/Mini volume £61.20; two volumes together £83.40.

All prices are for payment in advance, with postage included.
MARGARET McPHEE,
VNU Business Publications bv,
London W1.



IT COMES TO YOU FREE* FROM LASKYS



THE NEW COMMODORE PC20. £2,199.99. (EX.VAT.) *FREE DELIVERY - NORMALLY £70.00.

Laskys are offering free delivery and installation — normally costing £70 — on the new Commodore PC10 and PC20 personal computers.

And that's not all you can save — every Commodore PC also comes with a FREE Easy Wordstar word processor normally £165.00.

The new Commodores come with monitor, keyboard and built-in 5¼" 360K disk drive. The PC20 has an additional 10Mb fixed disk drive. Both computers offer 256K RAM, and a choice of colour or mono integral monitor.

All are IBM compatible and ideal for home or small business use.

COMMODORE PC10 MONO: £1,199.99 (exc VAT)
256K RAM, and twin 5¼" 360K floppy disk drive. Full keyboard, 12" monitor, and serial (RS232C) and parallel ports, plus four full sized expansion slots.

COMMODORE PC10 COLOUR: £1,599.99 (exc VAT)
256K RAM, and twin 5¼" 360K floppy disk drive. Full keyboard, and Paradise Modular graphics board. 12" colour monitor, and serial (RSC232C) and parallel ports, plus three full sized expansion slots.

COMMODORE PC20 MONO: £1,799.99 (exc VAT)
A powerful and versatile model with 256K and 10 Megabyte fixed disk drive, plus 5¼" floppy disk drive. Full keyboard, 12" monitor, and 3 full sized expansion ports, make it ideal for business use. Serial (RS232C) port, and parallel ports, give it full flexibility for all types of peripherals.

COMMODORE PC20 COLOUR: £2,199.99 (exc VAT)

A powerful and highly versatile full-feature model, with 256K RAM, and 10 Megabyte fixed disk drive, plus 5¼" floppy disk drive. Full keyboard, 12" colour monitor and Paradise Modular graphics board make this an ideal machine for virtually any application. Serial (RS232C) port and parallel port give maximum flexibility for peripherals and 2 full sized expansion slots are available to enable the Computer to grow with your needs.

Software from MicroPro International

- Wordstar, £295.99 (exc VAT)
- Wordstar 2000, £465.99 (exc VAT)
- Wordstar Professional, £399.99 (exc VAT)
- Pocket Wordstar, £103.99 (exc VAT)
- Superscript, £79.99 (exc VAT)
- Chartstar, £245.99 (exc VAT)
- Wordstar 2000 II shortly available.

9



● Circle No. 106

Laskys stores in: 42 TOTTENHAM COURT ROAD & 257 TOTTENHAM COURT ROAD, ABERDEEN, BEXLEY HEATH, BIRMINGHAM, BRENT CROSS, BRIGHTON, BRISTOL, BROMLEY, CAMBRIDGE, CARDIFF, CHATHAM, CHELTENHAM, CHESTER, COLCHESTER, COVENTRY, CRAWLEY, CROYDON, EALING, EDINBURGH, ENFIELD, EXETER, GLASGOW, GLOUCESTER, GUILDFORD, HARLOW, KINGSTON, LEEDS, LEICESTER, LEWISHAM, LIVERPOOL (2 STORES), LUTON, MAIDSTONE, MANCHESTER (2 STORES), NEWCASTLE, NORTHAMPTON, NOTTINGHAM, OXFORD, PETERBOROUGH, PLYMOUTH, PRESTON, READING, RICHMOND, ROMFORD, SHEFFIELD, SLOUGH, SOUTHAMPTON, SOUTHEND, WATFORD, WOLVERHAMPTON, YORK.

Superpro 286 clone

THE SUPERPRO 286 is a high-performance AT clone from PC Direct. Instead of offering a low-level entry system, PC Direct has opted to go well beyond the standard AT configuration. There is an 8MHz 80286, rather than 6MHz as on the IBM machine. Standard RAM is 1Mbyte, and there is a 60Mbyte Winchester with a 10Mbyte internal tape cartridge for backup. The cost for the system, with monitor and keyboard, is £6,375.

PC Direct also offers a range of IBM PC clones. More details from PC Direct, PO Box 551, Slough SL2 3TT. Telephone: (02814) 2417.

SSS dongle

DATA ENCRYPTION SYSTEMS has launched its SSS dongle. It plugs into the serial port of a machine, and is then interrogated by the software package being run. It transmits a key, which can be millions of bits long, into the computer to enable the software to be run. The serial port can still be used in the ordinary way once the software has been authorised.

The cost of the unit is £22.50. More information can be obtained from Data Encryption Systems Ltd, Nore Road, Portishead, Bristol BS20 8EY. Telephone: (0272) 849522.



Short-haul modems

CAE has produced a range of miniature short-haul modems designed for in-house installations. Each unit is only 10.2cm. long and requires no external power supply, deriving its power from the host machine.

Models are available with speeds up to 19,600 baud, and prices vary from £56 to £126. More details can be obtained from CAE Group, Akeman Street, Tring, Hertfordshire, HP23 6AJ. Telephone: (044282) 4011.

WIMPS BACK HOME ON THE XEROX 6085

AFTER relatively little activity in the area, Xerox has entered the business-micro market afresh with a machine which builds on many of the window, icon and mouse techniques it pioneered. Called rather uninspiringly the Xerox 6085, the desk-top machine is notable for its advanced graphics. The standard display is a 15in. screen which holds about four times as much information as a conventional PC. The other screen measures 19in. diagonally and can

show two full pages of display material.

RAM starts at 1.1Mbyte and can be upgraded to 3.7Mbyte. Hard-disc options vary from 10Mbyte to 80Mbyte. Floppy-disc storage is available which will accept IBM-format discs. Communication options include RS-232 ports.

Xerox has also launched a series of software packages for the machine, called Viewpoint, which includes most of the standard applications. There is an IBM PC

emulation package which allows Lotus 1-2-3 and other programs to be run from within windows, using a co-processor board. Other tasks can be run in other windows at the same time.

The entry-level price for a system with 1.1Mbyte of RAM and a 10Mbyte hard disc is £4,470. More information from Rank Xerox (U.K.) Ltd, Bridge House, Oxford Road, Uxbridge, Middlesex UB8 1HS. Telephone: (0895) 51133.



Wren price cut

THE DOUGHTY Wren computer lives on: Opus Supplies has cut the price by a half to just £495. For this you get a complete transportable eight-bit micro with a built-in autodial modem, 64K RAM, two 250K disc drives, CP/M Plus and Quantec's Executive Desktop software.

Details from Opus Supplies Ltd, 55 Ormside Way, Holmethorpe Industrial Estate, Redhill, Surrey RH1 2LW. Telephone: (0737) 65080.

Presentation graphics player

VIDEOSHOW 160 is a remote-controlled floppy-disc player system which enables video presentations to be shown without the need for a computer. Graphics are displayed to a 1,000-by-2,000 resolution.

The system works by using a floppy disc holding the graphics demonstration, which has previously been downloaded. The graphics are generated with the Pictureit package on the IBM PC.

The Videoshow system has 1Mbyte of RAM, which permits an entire picture disc to be resident in memory, eliminating the need to wait between images. There is also a wide range of transitional effects such as wipes, sweeps and fades.

The Videoshow 160 costs £5,200 and is available from Reflex Ltd, Wellington Industrial Estate, Basingstoke Road, Spencers Wood, Reading RG7 1AW. Telephone: (0734) 884611.



Gandalf mini line driver

THE MLDS-122 allows RS-232 signals to be sent over distances of up to five miles. Two units are required, and ordinary wiring can be used to connect them. They cost £75 each. No separate power supply is required. More from Rapid House, Denmark Street, High Wycombe, Buckinghamshire HP11 2ER. Telephone: (0494) 450111.



The windows, icon and mouse techniques that Xerox pioneered are now available on its own 6085.

Rair launches Workstation

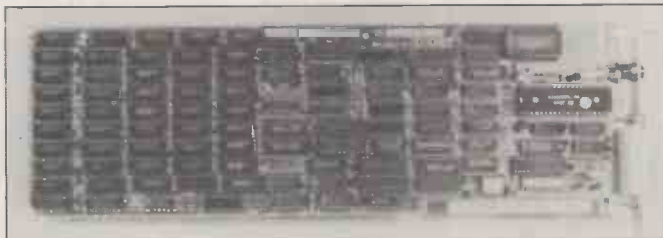
WITH THE LAUNCH of Rair's IBM-compatible Workstation, another British company has dipped its toe into the 1980s. As well as the standard 8088 processor, with 256K RAM expandable up to 512K, there is one floppy and a 12.8Mbyte or 25Mbyte Winchester

disc. Using Rair's new PC Integrator RS-232 comms package, the Workstation can be hooked up to Rair Minimicro and Supermicro systems. Prices start at around £2,600.

Rair has also announced upgrade boards for the ICL

Personal Computer range. The boards cost £1,625 and offer an 80286 and 80287 running under Concurrent DOS 4.1.

Details on both products from Rair Ltd, Wellington House, 6-9 Upper St. Martins Lane, London WC2H 9EQ. Tel: 01-836 6921.



Megafunction add-on

TECMAR has announced the Megafunction, a multi-function IBM add-on board. It gives 1,280K of RAM, which can be configured in two ways. You can have either 384K of system memory plus a RAM disc of 768K, or a 1,280K RAM disc. An optional daughter board allows an additional 2Mbyte of RAM to be added.

Megafunction also adds an

RS-232 port for a mouse, modem or serial printer with spooling capabilities. The board comes equipped with more than 20 personal productivity programs.

The Megafunction card costs £495, and is available from Tecmar International (U.K.) Westward House, Bramshall, Uttoxeter, Staffordshire ST14 5DN. Telephone: (08893) 2275.

Hardcard reaches the U.K.

FOLLOWING last month's launch in the U.K. of several plug-in Winchester for the IBM PC, the first of this breed has now arrived. Hardcard was launched in the U.S. in September 1985 by Plus Development Corporation, and over 10,000 cards were sold in the first three months. Unlike some cards, it requires only one expansion slot.

In the U.K. the price is £775, which includes one year's warranty. More from Computer Marketing Associates Ltd, CMA House, Lansbury Estate, Knaphill, Surrey GU21 2EW. Telephone: (04867) 4555.

Arabic keyboard

ALPHAMERIC has introduced an Arabic keyboard, mainly intended for the OEM market. The keyboard has Arabic characters on the top of the keys, and Latin characters on the side.

The keyboard is equipped with a microprocessor, so the code outputs and auto-repeat rate can all be controlled. Details from Alphameric Keyboards Limited, 6 Manor Way, Old Woking, Surrey GU22 2JK. Tel: (04862) 71555.



HARDWARE SHORTS

- Computopro has launched a colour version of its Compro 88 PC. The cost is £1,155, which includes the monitor. More on 01-439 1819.

- Laskys is to sell Commodore's IBMulator, the PC10, in its stores. The price has dropped to under £1,200. Half an hour of telephone support and free installation are part of the deal.

- Opus is offering a free colour-graphics card for the IBM PC with every Mitsubishi 14in. high-resolution monitor. The cost is £399.95. More on (0737) 65080.

- PC Telex from Dateline systems has been reduced in price to £1,295. This includes software and a modem. More information on 01-403 2221.

- FTS has enhanced its range of PCI multi-user micros. Added options include FTOS, based on Concurrent DOS 4.1, and up to 80Mbyte of hard-disc storage. Details on (05055) 4661.

- Video One is a half-length video card for the IBM PC and PC/AT. Features include a colour-emulation mode for monochrome monitors. The price is £445. More on 01-740 5758.

- An 8088 unit allowing access to IBM PC software for the Amstrad 6128 has been produced. The price of around £299 does not include a disc drive. More information on (09274) 20664.

- The Kimtron KT-7/PC terminal allows several users to be hooked up to an IBM PC or PC/AT via an RS-232 port. The cost is about £775 per terminal. Details on (0291) 423781.

- Tandata has cut the price of its QL communication package. QL Comms now costs £113. More on (06845) 68421.

- The Cambridge Microcomputer Centre has launched its Printer Manager, which allows data to be routed from difference units to a printer. Cost is £295. Details on (0223) 355404.

- The Brother HR-10 daisywheel printer now comes with RS-232 and Centronics ports. Cost is £265.

- The Philips P-2000C is available in a dual English/Arabic version. It comes complete with a dual word processor. More on 01-221 9269.

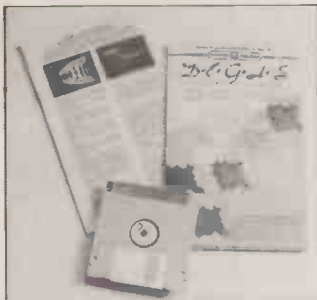


4-5-6 World

4-5-6 WORLD is a company specialising in Lotus add-ons. Products include Basic Concerto, which allows you to write Symphony applications. Other features include goal seeking, linear regression and loan calculations. The price is £75.

Sideways does just what you would expect: it lets you print out 1-2-3 spreadsheets sideways. It also works with word processors and project schedulers. The cost is £50. Spreadsheet Auditor allows you to check your input by displaying all the formulae and cell contents. There is also a cross-reference feature to trace the spreadsheet logic. The price is £110.

Contact 4-5-6 World, Saracen's House, 25 St. Margarets Green, Ipswich, Suffolk IP4 2BN. Telephone: (0473) 225952.



Degas on the 520ST

APPROPRIATELY enough, Degas is a graphics program, written for the Atari ST. It has 16 tools for freehand drawing, geometrical shape creation and an airbrush effect. Other features include a mirror function, shadow and magnify. The cost is £39.95 including VAT, and it is available from Ariolasoft at 68 Long Acre, London WC2E 9JH. Telephone: 01-836 3411.

Xenix tutor

SPHINX has produced an interactive micro-based tutor designed to teach Xenix users about the operating system. In all there are five modules which provide a total of eight hours of on-line tuition. The package runs under PC-DOS or MS-DOS, and requires 128K of RAM. The cost is £250. More information from Sphinx Ltd at 43-53 Moorbridge Road, Maidenhead, Berkshire SL6 8PL. Telephone: (0628) 75343.



AMSTRAD BANDWAGON STARTS TO ROLL

AS THE installed base of Amstrad PCW-8256 machines continues to grow, more and more business programs are starting to come through. For example, Sagesoft has released its Chit-Chat communications package. The price for either the email or viewdata part is £69.99; for both parts together it is £99.99. A full package with a modem costs £249.99. More details from Sagesoft plc, NEI House, Regent Centre, Gosforth, Newcastle upon Tyne NE3 3DS. Telephone: 091-284 7077.

Samleco Ltd is offering a package which allows Locoscript, the word processor bundled with the Amstrad, to use a daisywheel printer. For £699 you get the software and the 40cps DY-40 daisywheel printer. You will still

need to buy a parallel interface. Samleco is at 9 Fairacres Industrial Estate, Dedworth Road, Windsor, Berkshire SL4 4LE. Telephone: (0753) 854717.

Digital Research has announced that DR Graph, DR Draw, CBASIC compiler and Pascal/MT+ are to be released for the PCW-8256. The price for each is £49.95 including VAT. More information from Digital Research, Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB. Telephone: (0635) 35304.

An alternative word processor for the PCW-8256 is available from Optronics. It has a version of Superwriter, which can be used in conjunction with the Centronics/RS-232 adaptor to work with ordinary serial printers. Superwriter costs £99.99 including

VAT. More details from Optronics, Swan Island Harbour, 1 Strawberry Vale, Twickenham, Middlesex TW1 4RP. Telephone: 01-892 8455.

Workwriter Jr is a word processor which is available in German, French and Dutch versions as well as English. It costs £34.95, and comes from Micro Business Products, 11E Avenue de l'Observatoire, 1180 Brussels, Belgium. Telephone: (010 32 2) 375 0953.

A utility called Rotate allows Amstrad PCW-8256 users to print files sideways. It will work with spreadsheets like Supercalc and Multiplan. The cost is £19.95. More details from Trinity Business Systems, 52 Queens Road, Hethersett, Norwich NR9 3DB. Telephone: (0603) 812195.



In-a-Vision

IN-A-VISION is a drawing package for the IBM PC, PC/AT or any machine which runs Windows. Its graphics features include templates, full text enhancements, libraries of often-used symbols, overlays, and zooming. In-a-Vision allows multiple applications to be displayed in several windows simultaneously.

The price is £495. It is available from P&P Micro Distributors Ltd, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744.

New Volkswriter spells by sound

THE LATEST version of Volkswriter has been released in the U.K. One of its features is an anglicised spelling-checker dictionary with over 170,000 words. Spelling can be checked either by character or by phonetic search. Volkswriter 3 can also print one-off envelopes automatically by recognising the address block in a document.

There are basic maths functions such as percent, subtotal and constants, with column and row maths. Columns can be sorted in ascending or descending order, either alphabetically or num-

erically. An optional communications filter will strip out control characters automatically from files, which is useful for email.

Unusually, Volkswriter 3 offers compatibility with IBM's Topview system. It can also transfer files with Lotus 1-2-3, dBase II and III, Framework and other packages.

The cost is £325. For more information contact Lifetree Software Europe, Penthouse Floor, Hill House, Hill Avenue, Amersham, Buckinghamshire HP6 5BQ. Telephone: (02403) 28091.



SOFTWARE SHORTS

- Backpak is a backup program for the IBM PC/XT or PC/AT. It allows files on hard disc to be backed up on floppies. Also included in the price of £210 is California 10, a set of software-development tools. Details on (0753) 41278.

- Spellbinder Scientific for the IBM PC and Future computers allows scientific characters and formulae to be created and printed, and a library of formulae to be set up. The cost is £695. More on 01-680 6040.

- TDI has released Modula-2 for the Commodore Amiga. The price is 99.95 including VAT. More information on (0272) 742796.

- U-Microcomputers has announced the Mirage operating system for its micros. The price is £450. Details on (0925) 54117.

- A Smart user group has been formed. Contact John Hadley on (0273) 693555.

- Lattice C and Pascal have been made available for the Atari ST. Prices are £99.95 and £89.95 respectively. For information contact (0272) 428781.

- Top Class, which allows computer-based tutorials to be produced by non-programmers, is now available for the Apricot and BBC Micro; the prices are £290 and £145. More on (0773) 820011.

- The Centre for Software Engineering has announced Librarian and Salesman, two programs for a range of operating systems. They cost £150 each. More on (0724) 862169.

- A free demonstration disc of the project-management software Qwiknet is available from 01-491 4468.

- Autocad is available for the new IBM PC/RT. Details from Autodesk on 01-928 7868.

- Olivetti has released a colour graphics presentation which uses its Enhanced Graphics Controller. More information on 01-785 6666.

- AMT Graph allows colour graphs to be produced from Lotus 1-2-3 files. More details on (07536) 71464.

- Imagina is a personal-publishing program for 128K BBC machines. The cost is £50. More information on (077389) 658.



Anyware

ANYWARE gives remote users full keyboard control over all functions on a distant IBM PC or PC/AT. All you need in addition to the package is a modem to dial up the distant machine. Features include the ability to take up control after a break in communications, at the point where you left off. The price is £99, and more information can be obtained from Telesystems Ltd, 3 Wycombe Road, Prestwood, Buckinghamshire HP16 0ND. Telephone: (02406) 6365.

Stats packages

STATGRAPHICS is a statistics package from Mercia Software. It has over 350 functions and costs £995. More from Mercia Software Limited, Aston Science Park, Love Lane, Birmingham B7 4BJ. Telephone: 021-359 5096.

Statpro 2.0 is the new DOS version of the statistics package of the same name. It also costs £995, and can be obtained from Data Technology Ltd, Central Court, Knoll Rise, Orpington, Kent BR6 0JA. Telephone: (0689) 36231.

Lotus backs Windows

LOTUS has announced that it is to support Microsoft's Windows environment. What this means in practice is unclear. We can probably expect future Lotus products to be able to take advantage of some or all of Windows' features.



Putting software on the menu

DIRECT ACCESS is a menuing system which allows you to organise your programs into a user-defined menu system. It runs on the IBM PC. Passwords may be assigned to any software applications or DOS command within the menu system. You can also restrict the user from returning to the DOS

prompt or from going into the menu-maintenance section of the program.

The program costs £89 from P&P Micro Distributors, Todd Hall Road, Catts Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744.

Floppy advertising



WITH true Italian panache, Olivetti has come up with a disarmingly simple idea: advertising on floppies. Olivetti dealers will be selling floppies with demo programs on them. The cost of the discs is no more than that of ordinary blank discs. The current selection of demo software on boxes of 10 discs is WordStar 2000, Sapphire's database Dataease, Multimate, Supercalc 3, Multiplan, Easy, Gem, Superproject, the personal-presentation system PPS, and Word.

The hacker cracker

MOTOROLA has introduced a dial-back protection unit for communication systems. Called Response, it allows you to phone the computer as usual. It then takes the call, asks for the caller's password, checks the password against authorised users and then cuts the connection. It then calls back the authorised user's number as held in storage. Control is then passed back to the computer.

Response can also act as a call logger, as all calls are recorded with date and time. It can also function as a means of staggering access to a heavily used machine, by limiting each user to certain time slots only.

Response is built around a battery-backed CMOS memory for storing information and telephone numbers, passwords and time access periods for up to 400 users. The system may be expanded to deal with 1,200 users and up to 56 simultaneous connections. Prices start at around £6,000. Details from Motorola Information Systems Ltd, Chervil House, 28 Stafford Road, Wallington, Surrey SM6 9AL. Telephone: 01-669 4343.

BMMG Handbook

THE British Microcomputer Manufacturers Group has published its handbook for 1985-86. In it there are details of the member companies and their products. There are 30 companies listed, and information is given on company finances, history and products. There are a number of indexes. The BMMG is charging a nominal 50p. Copies are available from The Secretary, BMMG, Owles Hall, Buntingford, Hertfordshire SG9 9PL. Telephone: (0763) 71209.

Email starter kit

BROTHER has introduced a complete email starter kit for £399. It consists of a Brother EP-44 portable typewriter with an acoustic coupler, associated accessories and a subscription to One-to-One electronic mail. For more information contact Brother Computer Peripherals Division, Shepley Street, Guide Bridge, Audenshaw, Manchester M34 5JD. Telephone: 061-330 6531.

Europeans go for IBM PCs

THE EUROPEAN business PC market grew 56 percent in 1985, compared with 74 percent for the previous year according to a survey from Intelligent Electronics Europe. The lower figure reflects the slower sales in the U.K. and Germany, the two most mature PC markets. In Spain, Denmark and Switzerland growth was over 80 percent.

Not surprisingly, IBM has increased its market share from 27 percent to 33 percent, with Olivetti as number 2 with 11 percent. Commodore gained a sur-

prising 4.6 percent of the business market with its PC-10, recently reduced in price in the U.K. Apple had 9.3 percent, which is 8 percent down, and Apricot had 4 percent.

In 1985, the U.K. led Europe with 250,000 units shipped, against 230,000 in Germany and France, and 142,000 in Italy. The market survey costs \$1,450; \$200 for single-country studies. Details from Intelligent Electronics Europe, 15 rue Buffon, 75005 Paris. Telephone: (010 33 1) 45 35 43 83.

Tass and European dailies go on-line

TASS, the Soviet News service, is now available on-line through Datasolve's World Reporter service. The daily 40,000-word English newswire service is being added to other major newspaper sources such as the *FT*, the *Guardian*, the *Washington Post* and the *Economist*. Further details from World Reporter Marketing, Datasolve Ltd, Datasolve House, 99 Staines Road West, Sunbury-on-Thames, Middlesex TW16 7AH. Telephone: (0932) 785566.

The Financial Times Group has launched McCarthy Online, which offers a complete daily record of

full-text articles from the leading world publications, such as the main dailies throughout Europe. More information from McCarthy Information Ltd, Manor House, Ash Walk, Warminster, Wiltshire BA12 8PY. Tel: (0985) 215151.

Dialtech has a new bulletin board set up by the Health and Safety Executive Library and Information Services. It provides a twice-weekly updated service on health and safety publications and legislation. Details from ERA/IRS Dialtech, Ashdown House, 123 Victoria Street, London SW1E 6RB. Telephone: 01-212 5638.



A new business information service from McCarthy Online.

Free software guide

THE *Free Software* handbook lists 69 public-domain PC-DOS/MS-DOS programs, selected from nearly 1,000 now in existence. The collection ranges from business programs and utilities to a hacker's toolbox. In addition to the 300-page book which gives you the

documentation on the programs, there are four 360K discs which contain the software itself. The cost is £35. More information from Davis Rubin Associates Ltd, 1 Canonbourne, Weston-sub-Edge, Gloucestershire GL55 6QH. Tel: (0386) 841181.

SHORTS

● Ryman is to sell software for the Amstrad PCW-8256 at 13 of its stores, including the Tottenham Court Road branch. Details on 01-278 4919.

● You can now hire a 260Mbyte Worm disc for the IBM PC/XT for a monthly charge of £200. This will be refunded out of the purchase price of £2,995 if you go on to buy it. Details on 01-278 1510.

● Microlink users on Telecom Gold can now download the latest satellite weather pictures on their IBM PCs, Apples or BBCs. More on 061-456 8383.

● *The Software Guide for accountants* is designed to enable accountants to make informed software choices for clients. It costs £35, and is available on 01-439 4242.

● Research Machines has announced that it will offer a version of the BBC Domesday video-disc project system on its Nimbus machine.


● Focus is a new magazine section on Prestel. Page number is 123.

Cut-price info

ENTITLED *Working with VDUs* the Health and Safety Executive's booklet takes the form of a series of questions and answers dealing with the most common queries on the subject. It is free from area offices of the Health and Safety Executive. It is also displayed on Prestel, page 575993a. More information can be obtained on 01-221 0416, (0742) 752539 and 051-951 4381.

The British Standard Institution has produced a brochure giving the programme of publication of the Open System Interconnection drafts for development. Free copies can be obtained from the BSI Sales Department, Linford Wood, Milton Keynes MK14 6LE. Telephone: (0908) 320033.

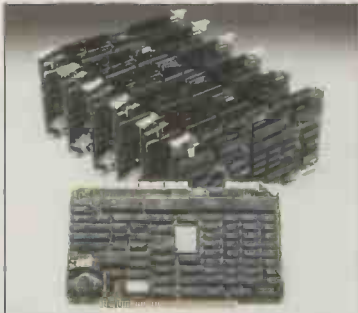
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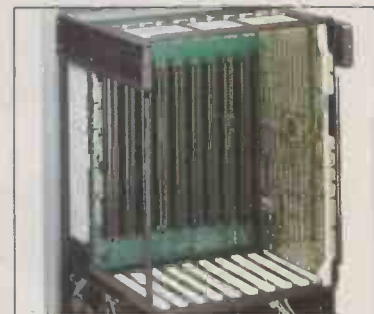
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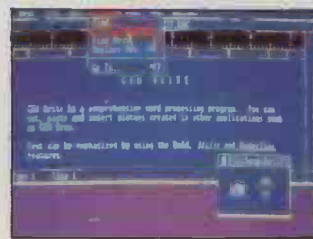
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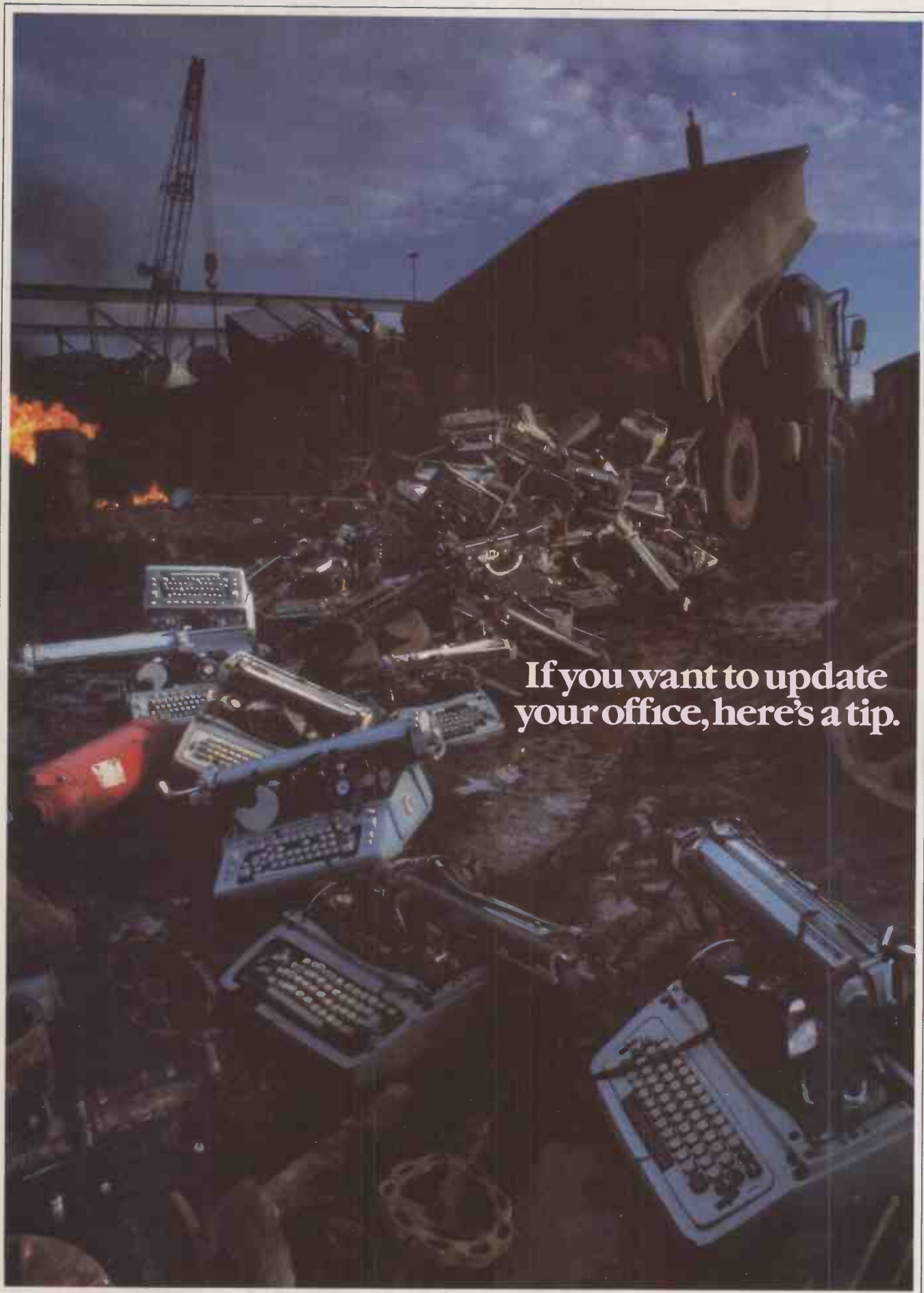
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It's a complete wordprocessor

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Training

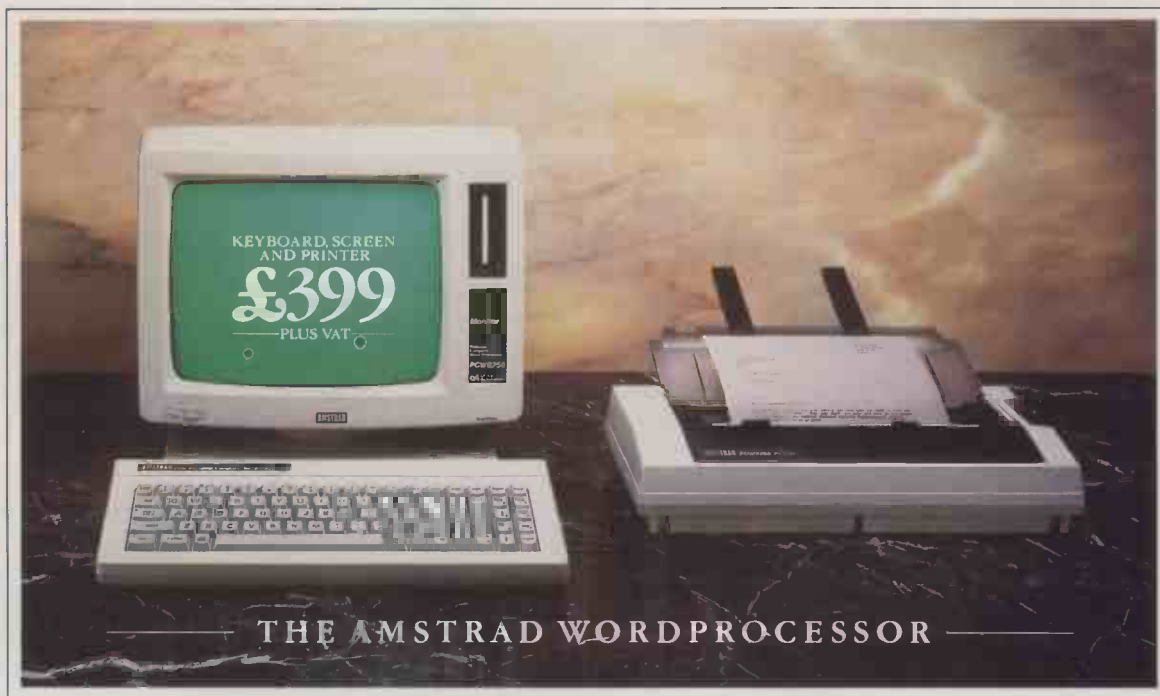
The PCW 8256 comes with a comprehensive user guide that tells you, in simple language, how to master its wordprocessing and computer capabilities.

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BY MIKE LEWIS

ASK THE EXPERT

How to program your own expert system.

the non-recursive tree-handling routines published in *Practical Computing*, January 1985 page 51.

The tree itself is held in three arrays which are combined in a record structure. Much of the program is concerned with initialising these arrays. In a large-scale system, both the text and the pointers might be held in external files and read in as required, but (continued on next page)

Suddenly, expert systems are all the rage. Some people are even claiming that they are the fifth application: the big money-spinner to follow WP, databases, spreadsheets and comms. To others, they are little more than an esoteric branch of artificial intelligence, something for academics to ponder in learned journals but of no great importance in our daily lives.

In fact, there is nothing at all obscure about these programs, and most readers of this page could probably produce one. Although the best expert systems borrow some pretty advanced techniques from AI, this tends to be reflected in the programs's front-end — the way it talks to its users — rather than with its fundamentals.

At heart, an expert system is a set of conditions which are applied to certain facts to arrive at a conclusion. It might well contain statements such as

IF (you have a pain in your shoulder)
 AND (it does not arise from a recent injury)
 AND (the pain has come on suddenly)
 AND ((your temperature is above normal) OR (you have recently begun to feel unwell))
 THEN (you might have rheumatic fever)

So, in theory, any doctor who is also a computer programmer should be able to develop an expert system for diagnosing aches and pains, just by coding a series of Basic If statements.

Of course, this over-simplified approach presents a number of problems, not least of which is the vast quantity of If statements that would be needed in any self-respecting diagnostic program. Apart from the tedium of coding

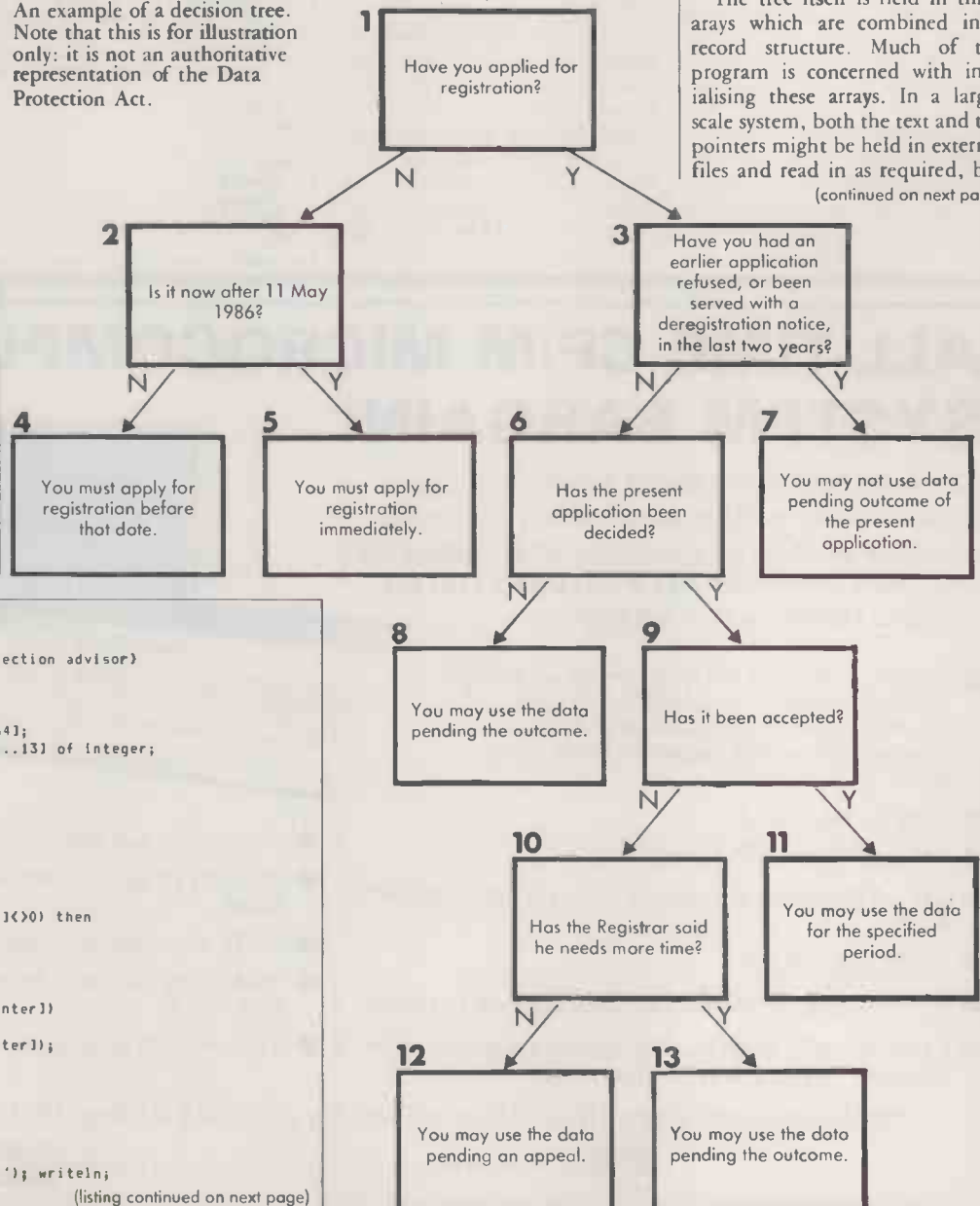
them, testing every path in the program would be a major chore.

Another difficulty is that the facts and conclusions are inextricably intertwined with the logic of the program. If you had to change some of the rules of the diagnosis, a large chunk of program might have to be redone. A design principle of an expert system should be to keep the information provided by the expert separate from the mechanics of the software.

To achieve this, some generalised method of storing the expert's knowledge is required. In many cases, these rules can be expressed as a series of binary variables, where each rule has one of two values: True or False. An obvious structure for them would be a binary tree.

Suppose you want to construct a program that advises computer users on their obligations under

An example of a decision tree. Note that this is for illustration only: it is not an authoritative representation of the Data Protection Act.



```

program advisor; (sample Data Protection advisor)
type
  fact=record
    text: array[1..13] of string[64];
    yespointer, nopointer: array[1..13] of integer;
  end;
var
  diagnosis: fact;
  response: char;
procedure ask(pointer:integer);
begin
  write(diagnosis.text[pointer]);
  if (diagnosis.yespointer[pointer]<>0) then
  begin
    read(trm,response); writeln;
    response:=upcase(response);
    if response='Y' then
      ask(diagnosis.yespointer[pointer])
    else
      ask(diagnosis.nopointer[pointer]);
  end;
end;
procedure signon;
begin
  writeln;
  writeln('Data Protection advisor'); writeln;
  
```

(listing continued on next page)

(continued from previous page)

the method of accessing the tree would be much the same.

The Ask procedure processes one node. It starts by printing the text, regardless of whether the node is a question or a conclusion. If it is a question the program waits for the user's response. It then makes a recursive call to Ask for dealing with the next node, the pointer to which is selected according to the user's answer. The main program does little more than call Ask for the root node.


A really useful expert system needs a lot more features than this example shows, so you should treat my program as a starting point only. For example, there should be some backtracking mechanism to allow the user to go backwards through the questions to change any of the answers. As it stands, the only cure for a typing error is to restart the program.

In a large system, the chances are that the same questions will appear in several nodes. An example from a medical application might be: "Is your temperature above normal?". The answer would always be the same within a session, but the pointers would lead along different paths. So it would be useful to maintain a list of all answers obtained so far,

and to check them just before asking each question.

Storing previous answers also allows the program to display them to the user on request and, as it were, to explain its reasons for arriving at a given conclusion. Also, the user should be able to ask for more information about the conclusion: say, the treatment for a particular diagnosis. An easy way of implementing this is to make the conclusion into another question, such as: "Do you want further information?"

Not all expert systems can be reduced to a simple binary tree. If you wanted to build a good generalised rule processor, you would have to allow for questions that have more than two answers. To obtain these answers from the user, you could employ a traditional menu, or you could allow the user to enter free text, with the program picking out keywords to decide the correct path.

The system might be based on some form of multi-way tree, where each node has a large but finite number of successors. Whatever your approach, some form of tree structure will inevitably form the kernel of your program, so the principles discussed here should be useful. 

(listing continued from previous page)

```
writeln('IMPORTANT: Demonstration of programming technique only');
writeln('No reliance should be placed on the information given');
writeln;
end;

procedure setarray;
begin
  with diagnosis do
  begin
    text[1]:='Have you applied for registration? ';
    nopointer[1]:=2; yespointer[1]:=3;
    text[2]:='Is it now after 11th May 1986? ';
    nopointer[2]:=4; yespointer[2]:=5;
    text[3]:='Earlier refusal/de-registration in last 2 years? ';
    nopointer[3]:=6; yespointer[3]:=7;
    text[4]:='You must apply for registration before that date ';
    nopointer[4]:=0; yespointer[4]:=0;
    text[5]:='You MUST apply for registration immediately ';
    nopointer[5]:=0; yespointer[5]:=0;
    text[6]:='Has the present application been decided? ';
    nopointer[6]:=8; yespointer[6]:=9;
    text[7]:='You may NOT use data pending outcome of this applic ';
    nopointer[7]:=0; yespointer[7]:=0;
    text[8]:='You may data pending outcome ';
    nopointer[8]:=0; yespointer[8]:=0;
    text[9]:='Has it been accepted? ';
    nopointer[9]:=10; yespointer[9]:=11;
    text[10]:='Has the Registrar said he needs more time? ';
    nopointer[10]:=12; yespointer[10]:=13;
    text[11]:='You may use the data for the specified period ';
    nopointer[11]:=0; yespointer[11]:=0;
    text[12]:='You may use the data pending an appeal ';
    nopointer[12]:=0; yespointer[12]:=0;
    text[13]:='You may use the data pending the outcome ';
    nopointer[13]:=0; yespointer[13]:=0;
  end;
end;

begin
  setarray;
  signon;
  ask(1);
end.
```

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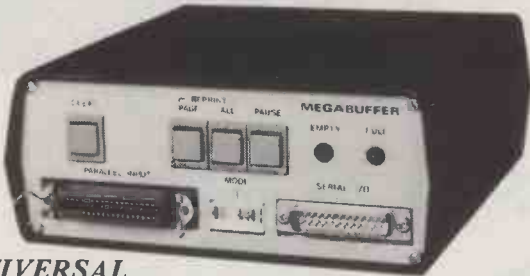


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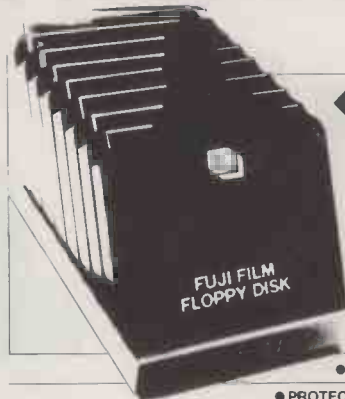
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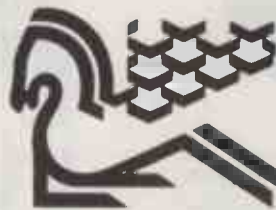
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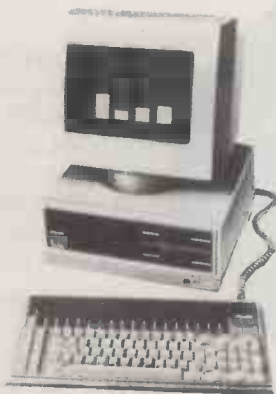
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BY RAY COLES

PACKING 'EM IN

The latest data-compression techniques could lead to breakthroughs in areas as diverse as networking and electronic photography.

both compressor and expander functions. Following initialisation via the system bus, the chip operates using 38 internal control registers and an external interrupt line.

The chip can be set up to use one-dimensional Huffman encoding/decoding, or two-dimensional Read encoding/decoding, depending on the application. The Huffman encoding scheme operates on pixels on a line-by-line basis, but the Read scheme operates on multiple lines for maximum compression. The number of lines to be operated on in the two-dimensional mode is set via a three-bit K parameter, with maximum compression achieved by setting all three bits to zero.

For the ultimate in fast-and-dirty transmission, the chip also has an Express mode, in which only every nth line is compressed for transmission; N can be up to 255. Each pixel line can be up to 16Kbit long, yielding document resolutions of up to 400 pixels per inch when necessary.

No doubt somebody is already hard at work adapting the principles used in the AMD-7970 to handle 12-bit colour images so that my dream camera can become a reality. Meanwhile I expect many interesting applications for the chip will be found in office networks, laser printers, photocopyers and facsimile terminals.

The only bad news seems to be the price, which is currently set at over £200 per device. Be careful with the soldering iron!



There has been a good deal of talk recently about the 35mm. camera of the future that will dispense entirely with conventional film and chemicals, relying instead on digital electronics, microprocessors and floppy discs. I'm not much of a photographer myself, but I do loose off a few shots now and again at pets, parties and summer holiday scenes, despite the awful drudgery of having to wait until the film is used up and the developing and printing completed before being able to see the results.

When the exorbitantly priced prints are finally retrieved from the chemist it is very often a disappointment to find that those never-to-be-repeated events of the holidays are underexposed, double exposed, or worse still have been sent to boy-racer of East Grinstead in exchange for fuzzy Instamatic shots of his much abused Capri. Sometimes I try colour slides instead, but my pleasure on observing the results is always tempered by the awful business of assembling the deck-chair like projection screen and wrestling with the intricacies of the slide-feed mechanism. For me, then, the electronic camera cannot come soon enough.

No films, no chemicals, no boy-racers, just a reusable microfloppy which can replay those frozen moments on to my standard television receiver. Perhaps I will even be able to read them into my PC and process them using techniques analogous to the highlighting, shading and colour-modification tricks used by the professional darkroom alchemists of today.

TECHNOLOGY IS HERE

All the technology required is available now. The light sensor can be a charge coupled device (CCD), and the shutter a microprocessor-controlled RAM array. In place of the film there will be a simple floppy disc and drive. Put a few of these on Dixon's shelves and ordinary mortals like David Bailey and me will break the doors down to get at them — assuming they don't cost too much, of course.

There has to be a problem, otherwise such a camera would be available already, so I have done a few sums to see what the snags might be. For reasonable resolution I suppose an image of say, 512 by 1,024 pixels would be needed. Allow four bits for each of the three primary colours then you end up with a digitised picture containing 6Mbits or three-quarters of a megabyte. If I want a standard 36-exposure capability that means 27Mbyte. At this point

visions of a rather expensive Winchester disc drive in a sort of rucksack loom and doubt sets in. All the proposals for future cameras I have seen seem to get by with the use of an inexpensive-looking microfloppy about two inches square, but even allowing for breakthroughs I cannot see something like that holding more than a megabyte.

DIGITAL PERIPHERAL

At this point I threw down my pencil, disenchanted as usual with the vagaries of photography, and reached for the latest pile of integrated-circuit data sheets to begin researching this month's Chip-Chat column. What I found there provides a potential key to the electronic-camera conundrum. Recently available from Advanced Micro Devices is the AMD-7970 Compression/Expansion processor, a digital peripheral for microprocessors like the PC's Intel 8088, designed for use in the next generation of laser printers, copiers and facsimile machines.

The chip compresses and expands two-tone bit-mapped image data in accordance with the international T-4 and T-6 CCITT compaction protocol standards for Groups 3 and 4 facsimile equipment. When let loose on a typical page of text, it can achieve a 30-to-1 compression ratio. In other words, it can reduce the amount of data needed to encode the image of a page like the one you are reading, to typically one-30th of that required to achieve the same resolution using a simple scanning digitiser.

Unfortunately, as it stands the AMD-7970 cannot perform the same magic on my photographic colour images because it is designed to handle only two-tone images such as printed text and graphics. The basic compression and expansion techniques it uses could, however, probably be adapted for use in the camera of the future. The basic principles of data compression have been known for many years, and in fact they are pretty obvious. The tricky part has always been to build the electronic hardware to implement the principles in a cost-effective way, but the task has become much simpler since the arrival of large-scale integrated circuits.

The simple logic I used to decide my camera picture resolution was based on the need to resolve the smallest object I wished to see, expressed as a fraction of the total scene area. To store an image of this page I need to resolve to a pixel size at least as small as a full stop. So the total number of data elements needed — in this case bits,

because they are either black or white — can be found by dividing the height and the width of the page into full-stop sized increments and then multiplying.

This approach to image storage is simple, but it ignores the fact that most images, especially text and graphics images, contain large areas of uniform colour. Subdividing these areas into identical pixel-sized data elements involves considerable redundancy.

Image-compression techniques retain the high resolution required, but reduce the total number of data elements by making use of the redundancy inherent in the image. In effect, only changes in the sampled data from one area to the next are encoded and stored, and the data storage space required is made proportional to the amount of information in the original scene.

EVERYDAY LSI

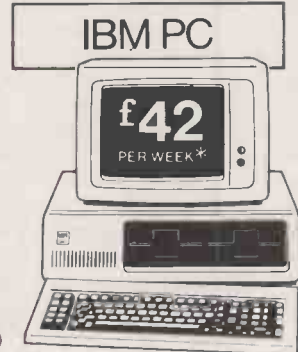
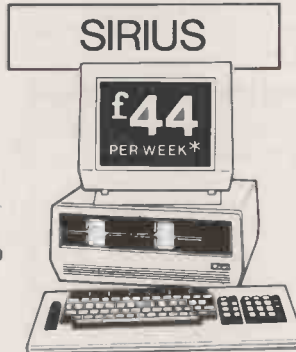
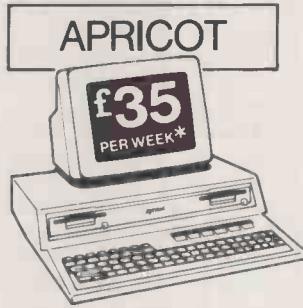
In the past, the cost of implementing the compression/expansion technique in hardware tended to restrict its use to major projects such as satellite image transmission. Today LSI technology has brought it into the realm of everyday items such as facsimile transmission/reception machines, which use it to reduce the required data rate and hence increase the image transmission speed over ordinary telephone channels.

The AMD-7970 device may not be the complete answer to my quest for the ultimate in electronic cameras, but it looks as though it could be very useful in many microprocessor-based text-image manipulation systems, dramatically reducing the storage space required on high-volume media such as tapes and discs, and slashing the time needed to transmit the data.

The processor is housed in a 68-pin ceramic leadless chip carrier and has a dual 24-bit multiplexed bus architecture to allow it to interface to both the system bus and to a separate local document-store memory array. Up to 16Mbyte of memory can be accessed from each of the buses, and pixel transmission rates of between two million and eight million per second can be achieved even at compression ratios of 50 to 1.

The chip contains separate compression and expansion processors, and can therefore operate in full-duplex mode, receiving and transmitting image data simultaneously. Starting addresses, buffer lengths and current addresses for raw and processed data are stored within independent on-chip registers for

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For many years coding or data-encryption systems have been used to prevent unauthorised persons gaining access to privileged information. In the past, most encryption systems took a great deal of time to encode and decode data — but then came the computer. Coding and decoding are accomplished by applying certain rules to a set of data repeatedly until the required result is obtained. Computers are particularly good at carrying out operations of this kind.

Simple cipher systems, where each character is substituted by another, can be implemented by any proficient computer programmer. Just as a computer can encode data, so it can be employed to decode a message, though it takes a great deal more computing power to break a code than to encode the message in the first place.

Conventional encryption methods available today can take advantage of the massive computing power of relatively cheap machines such as the IBM PC, but there is one snag. In the 1970s, Western governments realised that it would gradually become beyond even their computers' power to decode encrypted documents in a reasonable time. So, although organisations such as the CIA and the MI5 will never admit to it, any commercial encryption system is vetted by government departments before a company is allowed to patent its product.

RESTRICTED

Consequently, the best commercially available encryption systems to date are restricted to about 52- to 56-bit keywords. This makes for a realistic decoding time for the likes of a Cray computer, should the message warrant it. The existing Data Encryption Standard (DES) as defined by the U.S. National Security Agency in liaison with IBM uses 56 bits — a limit alleged to have been imposed by the CIA. As an indication of the limitations of the DES system, if 1,000,000 Sinclair Spectrums were to be connected in parallel, any DES-encrypted data could be decoded in a matter of hours.

One enterprising London firm, Microdex, has successfully moved two steps beyond the limitation of today's encryption systems. Its Ciphernet program is capable of working to 64-bit encryption, which is virtually uncrackable by existing technology. It is also capable of encrypting for transmission by most email systems such as Telecom Gold.

Ciphernet is designed to protect

email and disc files from unauthorised access. It encrypts them so that only a user who knows the correct password can access a protected file. Because of its email capability, ASCII, tokenised Basic programs and word-processing files can all be uploaded and downloaded without the problem of reserved characters or combinations which cause mailboxes to crash.

RESERVED SYMBOLS

The basic problems of email security are that commercial cipher systems tend to be either too complex to be implemented on most popular microprocessors quickly enough for on-line email encryption/decryption, or so weak that an analyst with only modest resources has a fair chance of breaking them. Also, email hosts reserve certain characters from the ASCII set, such as /, * and the full-stop to control user interaction with the system. So scrambling an ASCII file will usually produce a result which is rejected by the host. A typical example of this would be where a full-stop could be generated in an encrypted file to be uploaded to British Telecom's Telecom Gold email service. On receiving the full-stop character, the Telecom Gold computers will interpret subsequent characters on that line as commands and will not transmit them, thus losing part of the message.

Microdex, has developed an encryption scheme which it claims is impossible to break and which can be easily and quickly imple-

TABLE 1

System	Line length
Comet	80
Compuserve	80-139
Easylink	68
EIES	80
Geisco	80-158
Monodata	80
One to One	69
Peoplelink	80
Prestel	900
The Source	80-120
Telecom Gold	80-120
Tina	80

Email systems served by Ciphernet.

TABLE 2

Character	ASCII	Character	ASCII
£	35	@	64
*	42	C	67
+	43	L	76
.	46	M	77
/	47	N	78
:	58	Y	89
<	60	\	92
=	61	~	94

mented on most popular micros. This scheme can be used in eight- and six-bit modes.

The eight-bit mode is used for encrypting binary files transmitted using data-transmission error-checking protocols such as XModem, or for encrypting disc files. The six-bit mode is used to encrypt data files for transmission via email systems and it is this that the Ciphernet system concentrates on.

Ciphernet processes a mail file for transmission in three stages: compression, encryption and formatting. Conversely, deframming, decryption and separation must be done at the other end. Compression reduces the range of values of bytes in the text file to 64 by means of a shifting system. Encryption is accomplished by combining the compressed text file character by character with a stream of pseudo-random characters that are generated under the control of a user-specified password, which in turn is the key to the whole system. Formatting maps the encrypted file on to a set of 64 ASCII characters, none of which is used as a control code in any current email system.

SEPARATE RULES

Each email system has its own set of rules with regard to the range of characters and the format of the data that can be entered into individual items of mail. The parameters that vary include: the number of characters per line; forbidden characters, or those that have an undesirable effect; and the character string that is used to terminate or control the mailbox.

An email system profile is used to indicate the number of characters per line that are expected. The Ciphernet formatter inserts Carriage Return characters at these points to avoid the undesirable effects that might otherwise occur. In some systems this figure is variable up to a maximum limit and is kept as part of the user's profile on the system. A figure of 80 is assumed as being the industry norm.

As well as offering cheap local access to most of the country, packet-switching networks have



BY BEN KNOX

DO YOU WANT TO KEEP A SECRET?

Email messages are vulnerable to interception, but a new encryption system ensures they remain secure.

the annoying habit of automatically inserting Carriage Returns when particular terminal profiles are used. So careful attention needs to be paid to the PSS pad profile used in conjunction with Ciphernet. The Ciphernet software can handle the range of email systems shown in table 1.

Table 2 shows characters that have to be remapped to cope with the various email systems. When a mail file contains a character which is not one of the 64 characters used by the formatter, Ciphernet automatically assumes the file to have been corrupted by line noise. In order to maintain synchronisation, it must be passed to the decryption routine. The program therefore replaces such characters with an exclamation mark.

Ciphernet represents a substantial step forward in ensuring that communications stay secure. It overtakes existing computer-based encryption standards and also permits the resultant files to be transmitted over the many email services currently available. Programs for most popular makes of micro are in the process of being issued, and licences are available on request from Microdex.

For further information on Ciphernet, contact Microdex Ltd, 46 Key House, Bowling Green Street, London SE11 5TU. Telephone: 01-582 2933. Microdex is also on Telecom Gold 72:MAG 10173, and on Prestel box 019545011.





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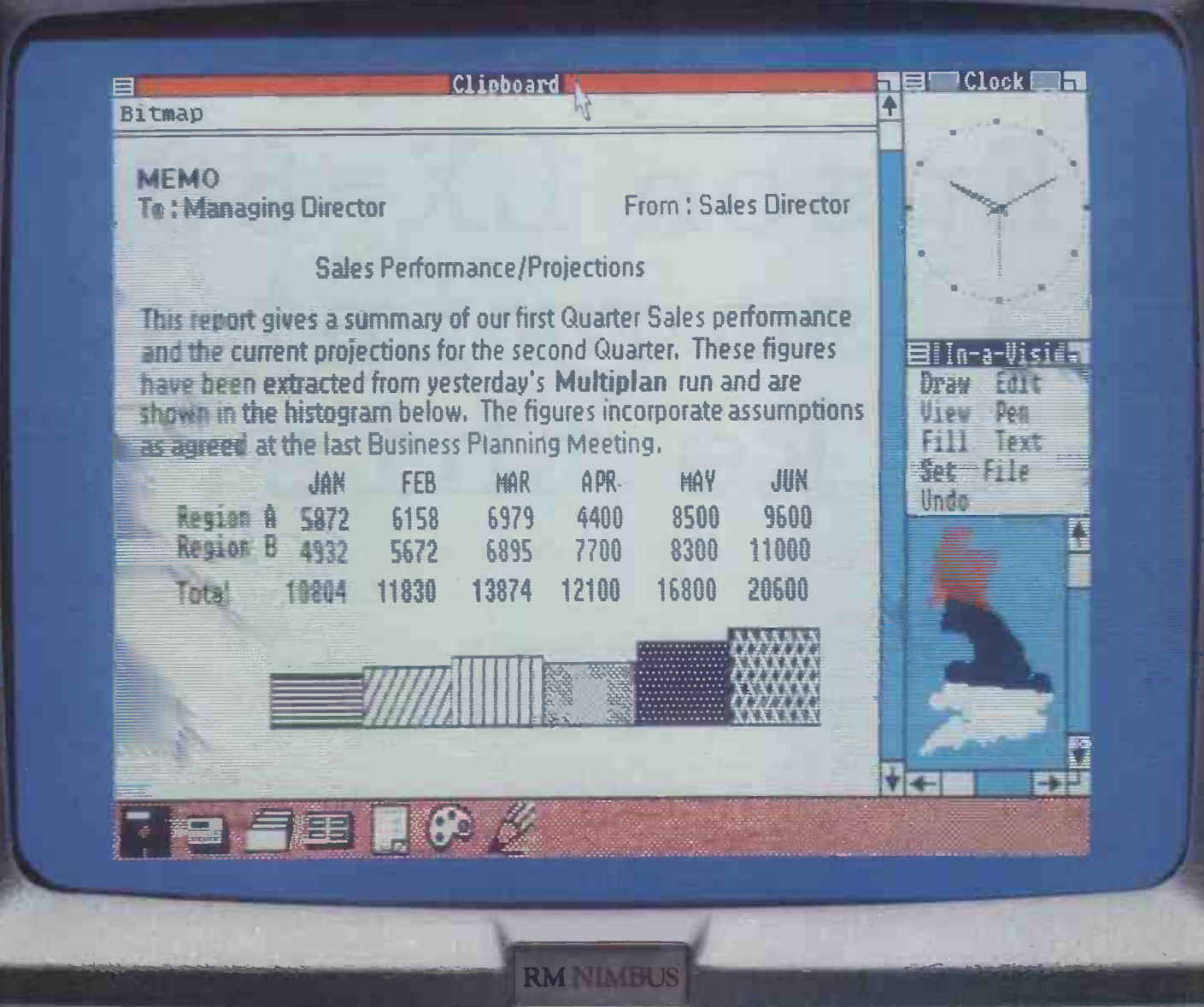
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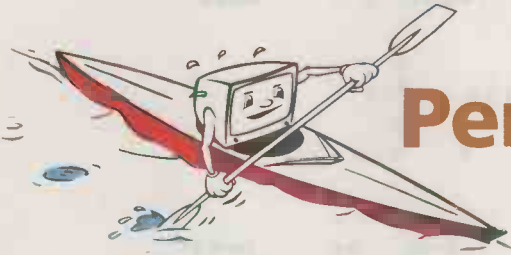
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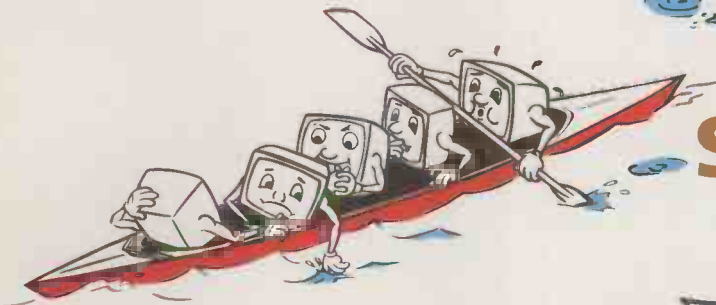
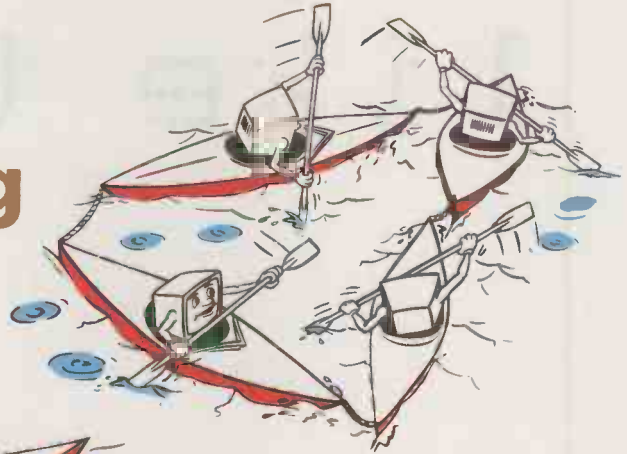
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Which Boat Are You In?



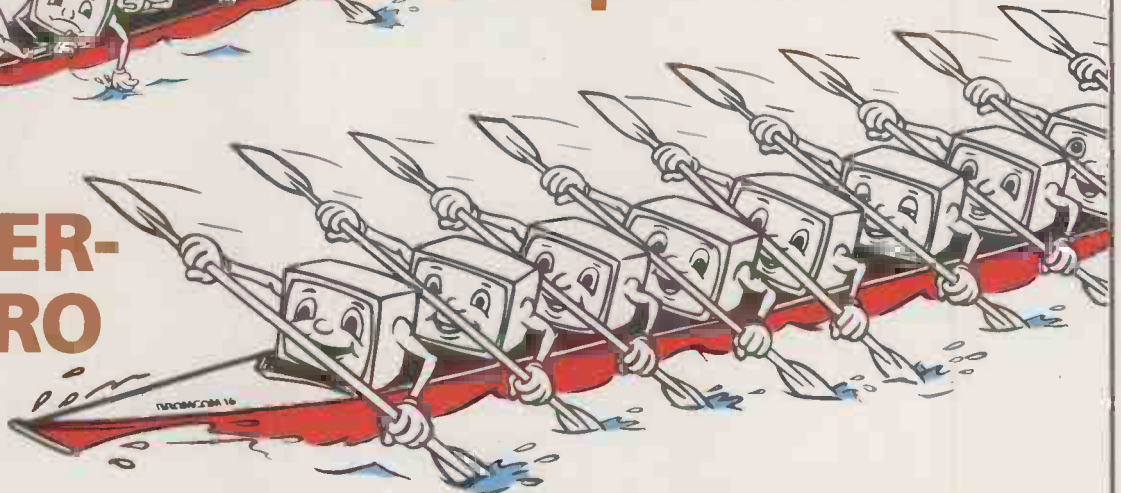
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Take a PC as equivalent to a single rowing boat. Just as a PC has one processor and one user, a single rowing boat has one passenger and one rowing power.

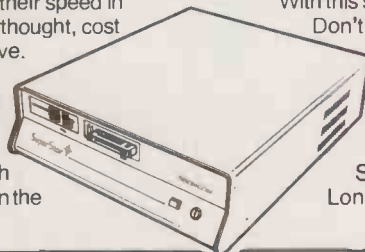
Then a network of PCs is a collection of such boats tied together trying to make a common journey; think of their speed in terms of a single boat, their co-ordination is an afterthought, cost per extra passenger is always the same — expensive.

The so-called Super-micro is just a longer boat with, typically four or so passengers, but essentially with still only one paddle to row with. Think of the speed again!

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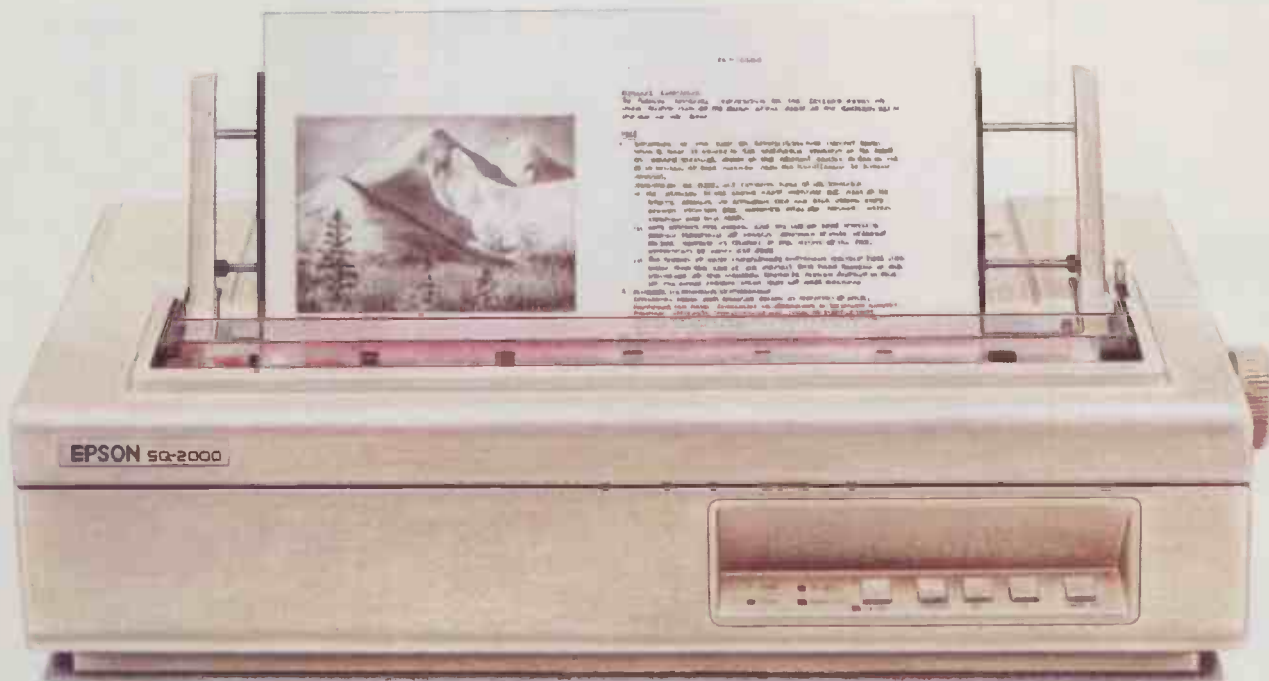


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Q A year ago, I bought an Advance 86B with 256K RAM. Advertisements at that time claimed that RAM was upgradable to 640K. Two authorised Ferranti dealers have proved unable to get RAM expansion cards to work in my machine, and I have been told that my machine, serial number A006880, belongs to a group of machines in which the expansion sockets will not accept additional RAM. Apparently there is a relatively simple fix for the problem, but I don't know where to get help.

MICHAEL BEDDOW

A The original computer designed by Advance had a design defect. The 256K of dynamic memory on the motherboard worked correctly, but any extra memory plugged in through an extra memory board in one of the IBM expansion slots did not. This was because Advance had forgotten to make the refresh work on these slots, and dynamic memory must be constantly refreshed or it will not work. Ferranti, which manufactured the computer for Advance, found how to fix the problem and also made a number of modifications and upgrades to improve the original machine. Any machines with serial numbers 14,000 or above have a new, improved ROM BIOS chip and some other small modifications. On these later machines there is no problem, and you can use up to 640K of memory. Early machines with serial numbers below 14,000 will all have the same problem.

I believe that the refresh problem can be put right by cutting a couple of tracks on the motherboard and soldering in a capacitor. Alternatively leg 20 of one of the EPROMs can be bent so that it does not go into its socket, and a wire link made from this to pin 22. Modifications of this sort could easily stop your computer working. Rather than do it myself I chose the safer course of having my machine altered by experts at the Ferranti factory in Oldham.

My modified and updated machine ran happily with 512K of memory, and later with the maximum of 640K in the machine. The modification included fitting a new BIOS chip, and some alterations to the motherboard. Ferranti can also do other modifications if you wish, such as fitting an interrupt modification so that you can run concurrent CP/M and fit an 8087 arithmetic co-processor chip.

CHEAP HARD DISCS AHEAD

Q I am wondering whether it is possible to enhance my Advance 86 by adding one of those hard discs that are being advertised so cheaply for the IBM. Any information that you might have on that score would be most welcome.

M BEDDOW

A At the Compec show before Christmas we saw an internally fitted 10Mbyte full-height hard disc with disc-controller board and cable at an incredible price. The price of hard discs has tumbled dramatically in the last year, and will fall still further. The capacity has increased too. Even though I am convinced that in a year's time 20Mbyte discs will be fitted as standard to every worthwhile machine, the price was so good that I ordered one.

Fitting to an IBM PC took about half an hour: 20 minutes checking the manual and 10 minutes' work. The drive itself is made by Bull/Honeywell, and though slightly old fashioned it fits instead of a full-height floppy drive. It needs a 130W power supply, as fitted to the IBM PC/XT, not the 65W supply fitted to early IBM PCs. The special show price was £250. A free-standing version with its own power supply and case was on offer at £399.

You could not fit the internal version with an Advance, because it has half-height floppy-disc drives and its power supply is not powerful enough. The external version should work fine. The firm selling these discs is Euro Electronics Ltd, Lancaster Gate House, 319 Pinner Road, Harrow HA1 4HF. Telephone: 01-863 0811. The same firm also sells other drives with larger capacities, half height, faster access, etc., but they cost appreciably more.

• • • • •

Q I am thinking of buying an MS-DOS micro on which I want to run WordStar, dBase II, CBasic and MBasic. I already use these programs and languages on a DEC Rainbow, and naturally I would like to be able to transfer files between the two machines. Also, will Z-80 CP/M run on CP/M-86 and vice versa?

CLIVE WARNER

A If you only want to do the transfer once, send your discs to a firm that specialises in copying discs from one format to another. Two that we know of are: Grey Matter, 4 Prigg Meadow, Ashburton, Devon TQ13 7DF, telephone (0364) 53499; or D&R Computer Services, 29 Highfield Road, Nuthall, Nottingham, telephone (0602) 761504. They will copy discs at £10 each plus the cost of the new disc, usually taking only a day.

If you will need to copy files across regularly you should use a program such as Moveit or BSTAM. The program must be mounted on both computers, and will allow you to transfer files from one machine to another, either by wiring the printer ports of both machines together, or via an acoustic coupler or modem and a telephone line.

An increasing number of

people are using Kermit as a program to transfer files from one micro to another, or between micros and mainframes. Kermit is widely used in both the U.S. and the U.K. It is non-proprietary, and may not be sold for profit. We use versions for the IBM PC, North Star Horizon and a Honeywell mainframe; we have also encountered versions for the Apricot and BBC model B, and there are general-purpose versions for CP/M-80 and MS-DOS. There are many others too.

CP/M-80 is written in eight-bit code, for eight-bit machines using the Intel 8080 or the Zilog Z-80 CPU chip. CP/M-86 and its rivals MS-DOS and PC-DOS are operating systems written for 16-bit computers using the 8088, 8086, 80186 and 80286 family of CPU chips, made by Intel.

An eight-bit operating system or an eight-bit machine-code program will not work on a 16-bit machine, and vice versa. Thus eight-bit versions of WordStar, dBase II or MBasic will not work on 16-bit machines. However, files containing text produced by a word processor are stored as ASCII characters, and Basic programs which have been stored as ASCII files, may be copied from eight-bit to 16-bit machines using the communications programs already mentioned, or by a specialist disc-copying firm.

Q My Sanyo MBC-555 permanently displays the tasks assigned to the function keys along the bottom of the screen. I changed the functions, but have no idea how to change the display. I would also like to change the default help levels, and the information on the various menus.

R V LISTER

A It is the 25th line of the screen on the Sanyo that gives a display showing what each of the function keys does. On an IBM PC this is easily altered with WordStar version 3.3 by using the WInstall installation program, and selecting the S option from the menu. This allows you to change both the function and the on-screen description of each of the function keys. Sanyo provides WordStar as part of the bundled software, but does not distribute the installation program.

To change the default values for Help you should go first to WordStar's No-File menu. Typing H followed by a number 0, 1, 2 or 3 resets the help level to the required value for this particular session. By default this value is set to 3 to give the maximum help. If you want to change the default help level permanently you should use the Install program and get to the patcher, then type the mnemonic

ITHHELP:

for early versions of WordStar, or

:ITHHELP

for later versions. The value 03 hex will be displayed, showing that the current help level is set to 3. If you type 2 and press Return you will set the help level to 2, and help levels 1 and 0 can be set in a similar way. If you reduce the default help from 3 it is a good idea to patch Nithlf as well. When you type

NITHLFL:

or

:NITHLFL

the value FF will be displayed, and you should change this to 0 and press Return. This will cause the following message to be displayed on the screen when you load WordStar: "For maximum help type ^JH3". This serves as a useful reminder how to change the help level.

If you want to change the messages actually displayed in the various help screens, this is more difficult. The messages are all stored in the overlay file Wsmgs.Ovr. If you must change these, do it by loading the overlay file under Debug and patching any appropriate bytes directly.

Q I recently bought your book *WordStar and CP/M Made Easy* and found it very easy to follow. One job is to print labels with Mail Merge. We followed the instructions, and the labels print correctly straight down, on a continuous roll. However, we are having a great deal of difficulty printing three labels across a sheet. The information sometimes appears in the correct place, but sometimes part of the address for the third label appears on a new line on the first label. Can you help?

P HEMSLEY

A The problem is that you want the information to print at specific tab positions, corresponding to the position of the three labels across a page. This is difficult when the length of the field that you want to insert is of variable length, and it is perhaps not too surprising that occasional hiccups occur.

You could cure the problem by making each entry for Name, Street, City, Postcode, Phone and Profession and so on identical in length by padding them out with trailing spaces to, say, 20 characters. This is extremely clumsy, and a more elegant solution, albeit a fiddle, is to print the first name on one line, using &Name1& followed by Control-P and Return at the end of this line. A minus sign will appear at the extreme right of the screen, to indicate that the next line will be printed on top of the present line. Then type the next line with the second Name in the correct position — that is, about 40 spaces followed by &Name2&. Type Control-P and return, and enter the third line with about 80 spaces followed by &Name3& and Return. In a similar way, the Street, City and Postcode are all entered as three lines on the screen. The listing above shows the file we used; the Control-P characters do not show.

Q I have an Apricot F1 on which I am running Silicon Office Junior, which has a single-sided format. The program will only load on single-sided discs, and since my machine can handle double-sided discs I am wasting a considerable amount of storage space. Is there any way that I can load the program on to discs that have been formatted double sided?

B SAMMS

LABEL PRINTER

```

..FILE TO PRINT ADDRESSES FROM FILE NAMES8 on 4 x 1+ in. sticky
Labels
.MT 0
.MB 0
.OP
.RM 120
.DF NAMES8
.RV NAME1,STREET1,CITY1,POSTCODE1,PHONE,PROFESSION
.RV NAME2,STREET2,CITY2,POSTCODE2,PHONE,PROFESSION
.RV NAME3,STREET3,CITY3,POSTCODE3,PHONE,PROFESSION
..three blank lines before address

..four sets of three lines are used for address
&NAME1&
&NAME2&
&NAME3&

&STREET1&
&STREET2&
&STREET3&

&CITY1&
&CITY2&
&CITY3&

&POSTCODE1&
&POSTCODE2&
&POSTCODE3&

..two blank lines after address

..CS
..file ends here
    
```

A The trouble you are having in copying single-sided discs on to a double-sided one could be because you are trying to use the Diskcopy utility program. Diskcopy will only copy the same format. There is coding for the disc format in the first disc sector, and thus double-sided discs cannot be read on a single-sided machine, as they have fewer tracks and store 315K instead of 720K.

If your machine has double-sided disc drives you should be able to format and prepare a system disc for double-sided or single-sided use with the Disk program on old machines, or by using Activity and selecting the disc functions on newer machines. You should be able to copy a single-sided disc, such as the one with Silicon Office Junior, on to this newly formatted double-sided disc that already contains DOS by using the Exit command from Activity to get back to MS-DOS, and then doing a straightforward Copy. Since you only have one disc drive, you will have to type the command

```
COPY *.* /s
```

which should prompt you to change discs when necessary until the copy is complete.

If the single-sided disc-copy procedure will not work try referring to the Microsoft Pack book which should be in the Apricot F version of the MS-DOS Users guide.

Q I have WordStar version 3.3 on my Sanyo 555 and have a problem with the £ symbol, which for my printer is 81hex. WordStar traps 81hex if assigned by patch or programmable key, either via Install or Debug, and reinterprets it as Control-X. Can you point me in the right direction so that I can defeat this trapping? Using the Graph key on the Sanyo produces the remaining 128 characters with the eighth bit set, so I can print the £ symbol, but I cannot write anything useful straight from the keyboard.

P A DUVAL

A Printing a £ sign from WordStar or any other software is a perennial problem. We suggest that under WordStar it would be worth trying ^PF to see if that does the trick. If it prints something else, you could patch the phantom space string at location :DPHSPC with the string

```
01 81
```

To do this, you should get to the patcher routine which is part of the Install or WInstall program normally provided with WordStar, as described several times previously in this column.

Sanyo provides WordStar as part of the free packaged software but does not give you the installation program. You could try using Debug to patch a couple of bytes: we think that for WordStar version 3.3 the address 07B0 should be patched. We do

not usually advise users to run Debug on WordStar, and we do not guarantee that this is correct, so make a backup copy of WordStar before doing anything.

Q I operate my BBC Micro on board ship, where the supply is at 110V and 60Hz. I can run the computer with no problems using a step-up transformer, and my monitor and printer can both be run at 110V. The disc drives run from the micro, so if I can run that from 110V too I will be able to dispense with the step-up transformer.

I dismantled the power supply with a view to fitting a different transformer. The power supply in question is manufactured by Astec Components Ltd in Hong Kong. The circuit boards is marked "1981 Astec Components Ltd", and at first glance it appears to have been made as a switchable unit; there is a solder link marked 230 volt and 115 volt on the top left-hand corner of the board. I think the 115V link bypasses the neutral side of a full-wave rectifier but without any information or knowledge of how this power supply works, I am loathe to experiment. Can I bridge this link and run on 110V?

E REDHEAD

A There have been four different types of power supply fitted to BBC computers. The 1981 Astec unit is the latest, and will work on 115V mains with no problems if the link you mention is made.

Q I often run big spreadsheets on an Apple IIe, and they are too wide to fit on normal paper. Can you recommend a program to print them out sideways?

C R CAPE

A Sidevise, written by Pace computers, is available from Leicester Computer Centre, 9 Jarrom Street, Leicester LE2 7DH. Telephone: (0533) 556268. It costs £40 and works with VisiCalc version 3.3. Sideways, written by Funk Software, is available from AC Interactive, Freeport, Leamington Spa, Warwickshire CV32 5BR. Telephone: (0926) 313345. It costs £43.40.

In either case you should check that the package will work with your printer.



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SOFTWARE

Multimate is one of the top word processors around: we review its latest version. There is also part 2 of our investigation of Paradox in which Mike Lewis gets to grips with its built-in programming language.

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Ferranti has produced an AT-alike. Find out how this U.K. machine fares in the fiercely competitive world of IBMulators. We also look at some of the new technologies coming through to give printers better quality at lower cost.

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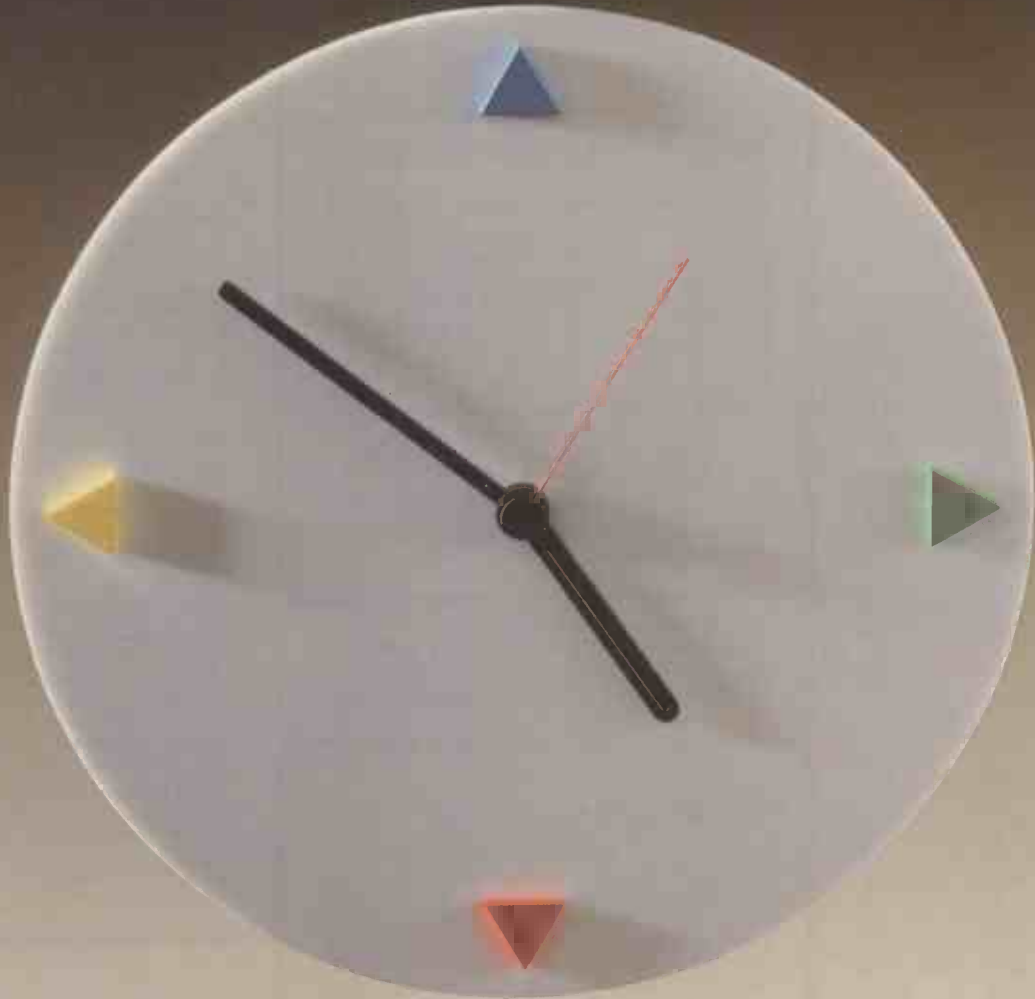
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DESPITE the fact that Acorn has wound down production of the BBC model B, the machine has several more years of active service. There are over half a million owners, many of them serious users in universities, offices and schools. It is still supported by third-party manufacturers and it manages to support three BBC-specific magazines.

As well as this, the appetite for books about the model B seems as strong as ever. However, much of the ground has already been covered by the large number of titles published in the last three years. The result is that new books have become increasingly specialised.

Ian Hutt's *40 Best Machine Code Routines* is a case in point. It supplies a good spread of different utilities, together with explanations of the algorithms used. Yet it is unlikely many people will key them in. If you are a machine-code programmer and need, say, a ready-made routine to print text strings, then you will find it useful.

Even more specialised are the three new reference guides. *The BBC Micro Advanced Reference Guide* by Bruce Smith does not contain any new material. The idea behind it is to save you from having to thumb through three or four different manuals but most of the information looks pretty familiar. Is there really any call for another list of the 6502 instruction set or the Osbyte routines?



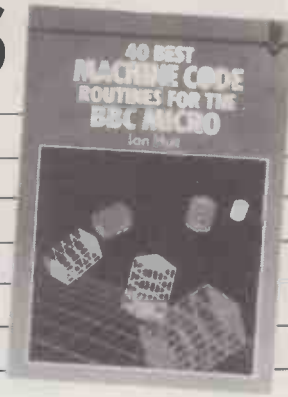
Roger Cullis's *Within the BBC Microcomputer* provides an exhaustive catalogue of all the principal ROM routines. There is page after page of machine-code addresses within Basic, OS 1.2, DFS, Econet and all their variants. Don Thomassen's *Guide to the BBC ROMs* restricts itself to Basic and the operating system. It is intended to be read alongside a disassembly of the ROMs. You can no more read these books than you can read a telephone directory. It is as if the BBC operating system had achieved the status of a sacred text, on which scholars can spend a lifetime writing commentaries.

Introducing CP/M on the BBC

DOWN TO DETAILS

Simon Beesley

discovers that new titles catering for faithful users of the BBC model B are increasingly concerned with specific applications and complex minutiae.



Micro Z-80 Second Processor is by Bruce Smith, who clearly knows his stuff. The book is a competent guide to using CP/M commands and utilities. Though why it devotes three chapters to the CP/M text editor, Ed, is a mystery. Surely few people use Ed rather than a fully-fledged word processing program.

Bruce Smith is also the author of a guide to Wordwise Plus. Publishing books on specific programs is a fairly recent trend, but already you can fill a shelf with guides to WordStar, for example. You might think that whole books devoted to one program are a little unnecessary. However, their value is to give the new user all the hints, tips and wrinkles that it would otherwise take months to discover. Bruce Smith's book does this quite comprehensively.

He is less successful with his program examples. Wordwise Plus's 70-command programming language is one of the reasons why it is the best-selling word processor for the model B. At the simplest level, it means you can print out multiple copies of a document easily. But far more sophisticated applications are possible, such as creating an index, which are not mentioned in the book.

Wordwise Plus is also given a detailed review in *The BBC Micro and the Small Business*, alongside View and two CP/M-based word processors. Overall, it provides an

excellent guide to each of the major categories of business software — spreadsheets, databases and so on. They are dealt with a chapter at a time by way of a detailed look at four specific applications.

The trouble is that the selection of these particular programs is already out of date: it does not include Computer Concepts' Inter Rom series, probably the most interesting new software for the model B. Inter Sheet and Inter Chart are the first two, and a word processor and a database will follow shortly. Together, these 16K ROMs provide an ingenious solution to the model B's major shortcoming: lack of available memory. Each ROM can share the same data, and each can be switched in and out while retaining the data in RAM.

The range and quality of ROM software for the model B is the best argument for taking the machine seriously as a business micro. If you are interested in running CP/M-80, you would do better to look elsewhere. It is almost cheaper to buy an Amstrad system than to add a second processor to the model B.

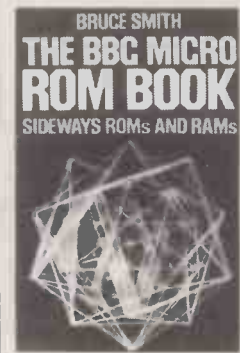
The advantages of ROM-based software over CP/M are that it is instantly available, faster, capable of exploiting the model B's special features, particularly graphics, and is generally cheaper. As the model B has only two spare ROM sockets,



BOOK REVIEWS

a ROM extension board is a necessity. *The BBC Micro ROM Book*, again by Bruce Smith, includes a useful survey of what is available. More interesting is the section on how to put your own bespoke software on ROM. This is an attractive possibility, particularly since 16K EPROMs now cost around £3.

Designing Software Projects for the BBC Micro gives good advice on how to plan a program before coding it: analysing your require-



ments, organising your data, choosing the right structure for it, preparing documentation — in short, systems analysis. If you are not doing a computer-science course, you will probably find this approach too schematic.

Likewise, Alan Whittle's *Mathematical Programs in BBC Basic* is more appropriate for school use. In fact it is intended to help A-level mathematics students. There are 32 annotated programs covering topics right across the syllabus, together with numerous exercises.

By way of contrast, *BBC Micro Advanced Programming* has a more general appeal. The word "advanced" has been progressively devalued so that it is now applied to any book which rises above the tutorial level, but this work deserves its title. Although the topics dealt with are often familiar ones like structured programming, it usually finds something new to say.

The Art of Microcomputer Graphics is probably the best book

(continued on next page)

BOOK REVIEWS

(continued from previous page)

of its kind yet. Jim McGregor and Alan Watt manage to explore almost every aspect of computer graphics within the limits of eight-bit processing power. They even include a lexicon of mathematical shapes. As graphics programming soon becomes dauntingly mathematical, it is particularly handy to have a set of programs and formulae for producing such shapes as spirals, cycloids and Lissajous figures.

Although the programs in the book are for the model B, its interest is much wider. For instance, there is a chapter on symmetry and two-dimensional ornamentation. It starts with a general discussion of all the ways in which a pattern can exhibit

DOWN TO DETAILS

40 Best Machine Code Routines for the BBC Micro by Ian Hutt. Published by Interface Publications, £7.95.

ISBN 0 907563 72 4

The BBC Micro Advanced Reference Guide by Bruce Smith. Published by Collins,

£10.95. ISBN 0 00 383223 6

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Microcomputer by Roger Cullis. Published by Losco, £11.95.

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Guide to the BBC ROMs by

Don Thomasson. Published by

Melbourne House, £9.95.

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Wordwise Plus — a User's

Guide by Bruce Smith. Published

by Collins, £9.95.

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The BBC Micro and the Small

Business by Simon Williams.

Published by the BBC, £5.75.

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Introducing CP/M on the BBC

Micro Z-80 Second

Processor by Bruce Smith.

Published by Collins, £9.95.

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The BBC Micro ROM Book by

Bruce Smith. Published by Collins,

£9.95. ISBN 0 00 383075 6

Designing Software Projects

for the BBC Micro by Ian

Murray. Published by Century

Communications, £9.95.

ISBN 0 7216 0285 2

Mathematical Programs in

BBC Basic by Alan Whittle.

Published by Prentice-Hall

International, £7.95.

ISBN 0 13 561903 3

BBC Micro Advanced

Programming by Joe Telford.

Published by Prentice-Hall

International, £9.95.

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The Art of Microcomputer

Graphics for the BBC Micro

by Jim McGregor and Alan Watt.

Published by Addison-Wesley,

£14.95. ISBN 0 201 14567 7

The Programmers' Trouble

Shooting Guide by Piers

Letcher. Published by Century

Communications, £7.95.

ISBN 0 7126 0574 6

Secrets of Software

Debugging by Truck Smith.

Published by Tab Books, \$13.95.

ISBN 0 8306 1811 2


symmetry — there are only 23 possible pattern classes — and goes on to provide programs to create examples of them.

At first glance *The Programmer's Trouble Shooting*

Guide looks promising. When you consider that it often takes as much time to debug programs as to write them, it is surprising that more books have not been written on the subject. However, this book

throws away its chances. It starts off well with a discussion of some typical Basic run-time errors. But when you reach chapter 5 there it is: "At the heart of the BBC Micro . . .". This phrase has now become the industry standard for describing the role of the micro-processor. Whenever it crops up the reader knows that what follows is yet another general introduction to the model B. The rest of the *Troubleshooter's Guide* says very little about debugging.

For a more thorough treatment of the subject, try to get hold of Truck Smith's *Secrets of Software Debugging*, published in the U.S. Although not about the model B, it passes on some invaluable lessons. As the author points out, debugging is as much an art as a science. Some people seem to have a nose for bugs which allows them to sniff them out almost instantly, yet it is mainly a matter of experience.

In fact, debugging can be a pleasure. Truck Smith's blow-by-blow account of how he traced the errors in his sample programs, written in Basic and 6502 assembly language, makes entertaining reading. Programmers know that, given time, every bug can be tracked down, and the hunt provides the same sort of challenge as solving a cryptic crossword. 

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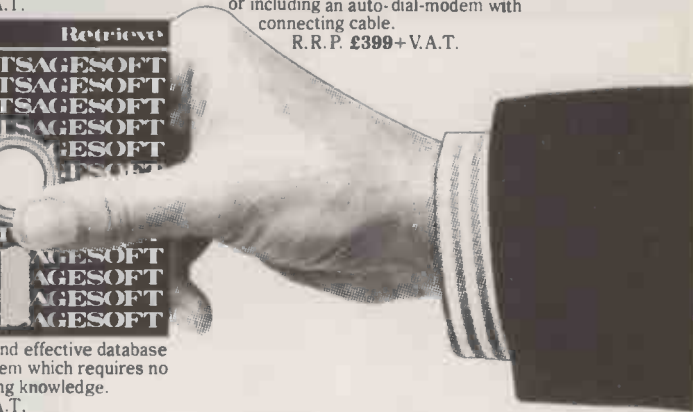
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Two Japanese giants are launching full-feature IBM-compatible computers with mobility as a bonus.

SONY SMC-210 TOSHIBA T2100 TRANSPORTABLE DESK-TOPS

By Ian Stobie

Computer manufacturers seem to like launching mains-powered IBM-compatible transportables. Until recently it has been difficult to see why, as few people have been buying them. The problem has been that these machines tend to fall between two stools. On the one hand they are not truly portable because they are not battery powered, on the other they usually offer fewer facilities than a conventional desk-top machine while costing more.

But things are changing. As display and storage technologies improve so transportables are getting more capable and cheaper. IBM itself is rumoured to be about to launch a lightweight mains-powered portable, usually referred to as the Clamshell or Convertible PC. This will give the transportable concept credibility and establish a standard format for software suppliers.

Without waiting for IBM, two large Japanese companies have gone ahead with lightweight IBM compatibles of their own, priced at around £2,000. Both the Toshiba and Sony machines use Sony-format 3.5in. microfloppies, as the IBM machine is expected to, and set out to achieve the same performance as the desk-top IBM PC.

Of the two, the Toshiba T2100 uses the more modern technology with its red-orange plasma screen. But it also makes more compromises to achieve portability. For example, the keyboard is rather cramped and is not in the conventional IBM layout. Sony's SMC-210 machine uses a more conservative LCD screen but has a more IBM-like keyboard.

The problem with transportables has been that to get the machines down to a convenient size certain things have had to be sacrificed. The heavy cathode-ray tube is out, but the lighter alternatives cannot display colour. Traditionally disc capacity has been limited and keyboards cramped. However, the discipline of designing a compact machine that travels well has produced some very well thought-out

computers such as Grid's Gridcase and the Ericsson Portable PC. It is clear that today's transportable is pioneering the design of tomorrow's office PC.

Both Sony and Toshiba believe that people are buying transportables because they want a compact and stylish machine for the office. For these buyers transportability is a bonus. Sony has gone furthest with the idea that it is producing a compact desk-top. The company expects to sell about half its machines without the built-in LCD display, to users who opt for a separate 9in. colour monitor instead.

The Sony SMC-210 looks more like an office machine than the Toshiba offering. It is in the off-white colour now much favoured for office machines, while the Toshiba T2100, with its dull black casing, resembles a piece of hi-fi equipment.

The Toshiba's keyboard is not an exact replica of an IBM PC's. The standard IBM layout is 18in. wide, so if you want to make a compact machine something has got to go. Toshiba has eliminated the separate numeric keypad and squeezed up the other keys. All the normal IBM keys like PrtSc PgUp and Alt are there, but the layout is different. For instance, the 10 function keys run along the top, under the screen. The end result is still good for touch-typing.

RED GLOW

When you turn on the Toshiba the screen background glows a very deep red, with text in a reddish orange. I found text displayed on this surface very readable compared to an LCD, and no worse than a typical conventional monitor. The advantage of gas plasma screens compared to an LCD is that they are brighter and more readable in badly lit rooms. They also let you display new pages more quickly, which can be useful with some graphic applications. Apart from greater expense, the disadvantage of the plasma screen is its inability to show a grey scale. By contrast Sony's LCD can show 16 different grey levels.

Toshiba's screen has 640 by 400 dots, so it

SPECIFICATIONS



TOSHIBA T2100

- CPU:** 8086-2, running at 4.77MHz or 7.16MHz
- RAM:** 256K expandable to 640K
- Discs:** one or two double-sided 3.5in. floppy drives, 360K each side
- Display:** flat fold-down 25-line by 80-column, 640- by 400-dot gas plasma display; connects to optional colour monitor
- Keyboard:** QWERTY with 10 function keys; non-IBM layout
- Modem:** optional internal direct-connect 300/1,200-baud modem; BT approval applied for
- Interfaces:** serial and parallel ports, expansion connector
- Dimensions:** 360mm. (14.2in.) x 311mm. (12.2in.) x 80mm. (3.1in.)
- Weight:** 5.9kg. (13lb.)
- Software in price:** MS-DOS 2.11
- Price:** £1,950 for single-disc system, £2,100 for two-disc system
- Hardware options:** IBM-format 5.25in. floppy-disc drive, five-slot external expansion chassis
- Manufacturer:** Toshiba Corporation of Tokyo, Japan
- U.K. supplier:** Toshiba (U.K.) Ltd, IPS Division, Toshiba House, Frimley Road, Frimley, Camberley, Surrey GU16 5JJ. Telephone: (0276) 62222
- Available:** now

can show IBM monochrome graphics in enhanced high resolution. The T2100 generates an RGB and composite video signal too, so you can plug a colour monitor into the machine if you prefer. Toshiba offers a suitable colour unit for £495.

Underneath the display on the Toshiba there is a row of indicator lights showing things like which disc is accessing, or whether the Caps and Num Lock on the keyboard are engaged. The light on the far left is labelled Power/Speed and shows whether you have the processor running at normal IBM speed or quicker. Toshiba has built the T2100 around the 8086-2 chip, which can be induced to run 50 percent faster than normal. This is useful if you are doing CPU-intensive tasks like heavy number crunching or compiling. The speed is altered by issuing the appropriate command from the keyboard.

The Toshiba's 3.5in microfloppy-disc



SONY SMC-210

CPU: 80C88, CMOS variant of the 8088, running at 4.77MHz
RAM: 640K standard
Discs: two double-sided 3.5in. floppy drives, 360K each side
Display: flat fold-down 25-line by 80-column LCD, capable of showing standard IBM 640- by 200-dot monochrome graphics; also available with external 9in. Sony colour monitor
Keyboard: QWERTY plus 10 function keys and numeric pad in IBM PC/AT-like layout
Modem: built-in direct-connect 300-baud modem with pulse and tone automatic dialling is standard; BT approval applied for
Interfaces: serial and parallel ports, mouse port, acoustic-coupler port, expansion connector

Dimensions: 362mm. (14.3in.) x 290mm. (16.5in.) x 83mm. (3.3in.)
Weight: 6kg. (13lb.)
Software in price: MS-DOS 2.11, comms program
Price: £2,195 for system with LCD screen; £2,295 with 10in. colour monitor instead of LCD
Hardware options: standard IBM-format external 5.25in. floppy-disc drive, around £190; external expansion chassis with three full-length IBM-compatible card slots about £395
Manufacturer: Sony Corporation of Tokyo, Japan
U.K. supplier: Sony (U.K.) Ltd, Sony House, South Street, Staines, Middlesex TW18 4PF. Telephone (0784) 61688
Available: May 1986

drives are mounted on either side of the machine — you can buy the system with one or two built-in drives. The prices are £1,950 or £2,100 respectively, both with a standard 256K of RAM.

While the Toshiba's processor and firmware are fully IBM compatible, what about the discs? At the moment no personal computer from IBM itself has 3.5in. drives, although the rumoured Clamshell will supposedly be using them. Despite the physical difference in size, the Toshiba discs are formatted in the same way as standard IBM discs, with the same numbers of tracks and sectors per side giving a total capacity of 720K per drive. This should make it easy for software houses to transfer programs across. Toshiba says it is making an external add-on 5.25in. drive available, so you could do it yourself.

This drive connects to the parallel port on the back of the machine, which doubles as

both a printer and floppy-disc connector. Also along the back are a serial port, an RGB port for an external monitor and a metal plate covering a general-purpose expansion port into which you can connect a mouse. The plate lifts off to reveal a single card slot, into which you can fit various options for portable use, or attach an optional external expansion chassis for use on a desk. The expansion chassis will take five IBM-compatible cards. Toshiba will offer an 300/1,200-baud dual-speed modem to fit into the internal slot; it is currently going through the BT approval process.

Sony's SMC-210, is the company's first major computer product in the U.K. It will be available in two versions: the fully transportable version with a built-in 25-line by 80-column LCD screen, the other with a separate 9in. Trinitron monitor. You can also use the Trinitron or any other standard monitor with the LCD model. Both models

come with a full 640K as standard, two disc drives and a mouse. Pricing is provisionally £2,195 for the LCD model or £2,295 with the external monitor. The monitor on its own costs £425.

The Sony LCD panel is a very large one measuring 11in. diagonally. The screen consists of 640 by 200 dots, which is the standard IBM resolution. The Toshiba T1200's screen offers greater vertical resolution. Unlike some LCD screens the Sony one shows text in the correct ratio of height to width.

For an LCD screen the contrast is quite good, and a contrast knob to the right of the screen adjusts the optimum vertical viewing angle. The acceptance angle is quite wide and you still can read the screen even if you are not looking at it flat on.

GOOD COMPROMISE

Sony's keyboard is a good compromise between compactness and IBM compatibility. It has a numeric pad on the right and a function-key block in normal IBM shape on the left-hand side, positioned above the main keyboard to save space. A recess for keyboard templates lies next to the function keys. The layout of the main part of the keyboard is like the IBM PC/AT's.

Sony has put its two double-sided disc drives on top of the machine above the keyboard. They are spring mounted and push down flush with the surface of the machine when you put in a new disc. As on the Toshiba you get 360K per side.

I saw Lotus 1-2-3 and several other familiar IBM packages working from the SMC-210's 3.5in. drives. Sony has arranged for Softsel to transfer the majority of its IBM catalogue across on to the small format, which amounts to about 250 packages.

According to Sony over 100 packages have been transferred ready for the machine's launch in May. You can also fit an external 5.25in. drive to the machine. Cumana will be offering one priced at £190.

At the back of the machine are a standard serial and parallel port plus the mouse port, an RGB video output, an external disc-drive interface, an acoustic-coupler port and an expansion connector. The mouse comes standard with the machine and is of the Microsoft two-button type. There is a port for an acoustic-coupling modem, and Sony plans to provide a built-in direct-connect 300-baud modem.

CONCLUSIONS

■ Both machines show that the transportable is continuing to increase in power and decline in price. You now lose little in performance compared to a desk-top PC.

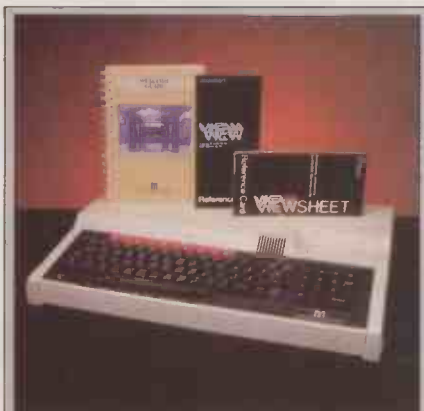
■ The one weak area left is the display. Toshiba has opted for the more expensive plasma technology: it is crisp and sharp, but you do miss out on colour. The Sony is more flexible: you have the LCD for portability or a separate monitor if colour is essential.

■ The 3.5in. Sony-format discs are so nearly a standard that there should be little difficulty in getting software for either of these machines. They are thoroughly IBM-compatible in most other respects.

BBC MASTER SERIES

THE ULTIMATE REFINEMENT?

By Roger Cullis



The case itself is in the familiar model B livery. However, it is humped behind the keyboard to provide more space for cooling and the addition of internal plug-ins, such as a modem.

SPECIFICATION

CPU: 65C12 running at 2MHz; optional internal 4MHz 65C102, 8MHz 80186, 8MHz 32016 second processors; optional external 65C02, Z-80 or 32016 external second processors

ROM: 128K

RAM: 128K dynamic RAM; 50 bytes battery-backed CMOS RAM

Display outputs: modulated UHF, RGB and composite

Other interfaces: cassette, RS-423, Centronics, user port, twin ROM cartridge socket with enhanced 1MHz bus, external 1MHz bus, Tube, audio output, d.c. power 12V, 5V, -5V

Keyboard: QWERTY plus numeric function keypad, cursor pad, nine function keys, lockable Break key

Sound: three channels, plus noise

Operating software: OS version 3, double- and single-density DFS; optional Econet with ANFS

Applications software: BBC Basic 4, View word processor, Viewsheet spreadsheet, Editor, Terminal, extended graphics routines; all supplied as standard on ROM

Size: 346mm. (13.6in.) x 447mm. (17.6in.) x 85mm. (3.3in.)

U.K. prices: Master 128 £499 including VAT; Turbo upgrade £125; ET £399; Master 512 probably under £1,000; Master Scientific probably under £1,600

Manufacturer: Acorn Computers Ltd, Cambridge Technopark, 645 Newmarket Road, Cambridge CB5 8PD. Telephone: (0223) 214411

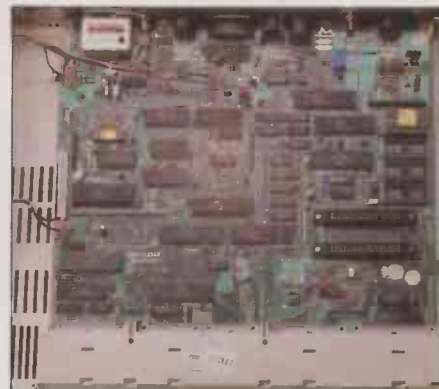
Availability: Master 128, ET and Turbo available now; Master 512 and Scientific, summer 1986

Established eight-bit technology, pushed to the limit, extends the horizons of the BBC Micro's existing user base.

Over 8,000 separate items of hardware and software for the existing BBC model B micro were on display when the Master Series was launched early this year. With that depth of third-party support, it is not surprising that Acorn has chosen to make its new micros largely compatible with the old machines. Yet it has to keep up with the competition in a world where IBM-compatible software dominates business computing and 68000-based machines are beginning to entice more technically orientated users.

The result is the five computers which make up the BBC Master Series. The base model is the Master 128, which is an updated version of the 128K BBC model B+. The Master Turbo has a built-in 65C102 language processor with 64K of dynamic RAM. The Master 512 with its 512K RAM and additional 80186 processor provides a bridge into the IBM universe. It comes complete with Digital Research's Gem and DOS Plus, which offers compatibility with both MS-DOS 2.1 and CP/M-86.

The Master Scientific is a 512K version of the Acorn Cambridge Co-Processor with an internal National Semiconductor 32016 second processor. The final machine in the series is the Econet Terminal (ET). It consists of a base machine complete with Econet, but with printer interfaces removed to keep costs down.



We had a Master 128 for review. The main external innovation is the redesign of the keyboard layout. The function keys are now spaced away from Break, reducing the chances of pressing it accidentally. It is also possible to set a mechanical latch which disables Break completely. The cursor keys are arranged in a diamond layout. There is also a separate numeric keypad, which includes the symbols +, -, *, / and #, alongside Delete and Return.

The famous "ash tray", which was intended for use with the ROM filing system, is absent on the new machine. Instead, there are two cartridge sockets, positioned behind the numeric keypad. The arrangement is based on that of the Electron Plus 1 system, and most of the existing cartridges will function in the Master, since the connections are a superset of the Electron's. Also present on the bus is a full set of 1MHz bus connections, uprated to a 2MHz clock rate, which will provide new opportunities for third-party peripherals. A special cartridge fitted with two zero-extraction-force sockets has already been released for use with existing ROM software.

BASIC BENCHMARKS

The operating system and Basic exploit the more compact instruction set of the 65C12 processor to provide a substantial improvement in operating speed. The improved performance of the Turbo's internal processor over the Master 128 with an external second processor reflects an increase in clock rate from 3MHz to 4MHz. The Benchmark routines were published in the January 1984 issue of *Practical Computing*, page 102. Timings are in seconds.

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Master 128 — 65C12	0.5	2.6	6.1	6.3	7.8	11.9	18.2	29.6	10.38
Bas-128 — 65C12	0.9	4.7	11.4	11.6	13.6	20.4	33.9	56.9	19.16
Master 128, external second processor — 65C02	0.4	1.7	4.1	4.2	5.2	8.0	12.1	19.8	6.92
Master Turbo — 65C102	0.3	1.3	3.0	3.1	3.8	5.8	8.8	14.3	5.03
Model B/B+ — 6512	0.7	3.2	8.2	8.9	10.4	15.4	23.3	52.6	15.53
Model B/B+, second processor — 65C02	0.4	2.1	5.5	6.0	7.0	10.3	15.5	35.6	10.27



Above: The Econet interface plugs into two connectors located at the top right-hand corner of the PCB. The large white connector on the left of the PCB allows a modem or other internal add-ons to be attached, though the limited cooling within the case is a restriction.

Left: The new motherboard is bigger than its predecessor but has fewer chips.

On the underside, IDC connectors are provided for a printer, disc interface, user port and for the 1MHz bus and the Tube, which are now fully buffered. The rear connectors are the same as on the model B, with the addition of a phono connector for an external speaker or audio amplifier. The case itself is in the familiar livery, but ventilation has been improved, and it has been made strong enough to support the weight of a monitor.

The power supply has been updated to 50W, and the power-connector tabs no longer come apart in your hand. The motherboard is bigger too, though the chip count has been reduced. Four chips now provide 128K of dynamic RAM, where 16 were required for 32K on the model B. A single 1Mbit ROM contains all of the firmware which comes with the computer, and there are three empty sockets for additional 32K or 16K ROMs. The processor is a 65C12, the CMOS version of the 6512 used in the B+. I/O is still controlled by 6522 VIAs, a PD-7002 analogue to digital converter and a 1770 floppy-disc controller. Acorn has improved the PAL UHF decoding, but it is still not good enough for sustained working in 80-column mode on a TV.

Some Econet circuitry is now provided as standard, although the interface and ADLC chip come on a separate daughter board which plugs into two connectors located at the top right-hand corner of the PCB. A similar arrangement is used to accommodate the language processor and its associated memory on the Turbo, the Master 512 and the Master Scientific. There is space at the left-hand edge of the board for a modem or other internal peripherals.

The other remaining hardware feature of note is a battery-powered real-time clock-calendar with CMOS RAM. Some of this RAM is used to hold default values for par-

ameters such as the start-up language and filing system.

The CMOS 65C12 processor has an enhanced version of the original 6502 instruction set. Many operations now require fewer instructions, and code can be much more compact. The operating system and Basic interpreter have been completely rewritten to take advantage of this.

The Series 3 OS, found on all the Master Series machines except the ET, features shadow screen modes as in the model B+, and a range of new * commands. It is now possible to access files from different filing systems simultaneously by prefixing the file

BBC MASTER SERIES 128				
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 checked="" 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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Acorn's Master is in a class of its own.				

name with the filing-system name. The cassette filing system has been upgraded to perform some further filing-system calls.

A large number of graphics features have been imported from the recently launched graphics extension ROM — see *Practical Computing*, December 1985 — but these do not include sprites. The soft character set is now fully exploded and a complete alternative character set, including Greek letters, mathematical symbols and European characters and accents, is implemented for ASCII codes 128 to 255 for all modes apart from Teletext mode.

Basic 4 incorporates a number of changes which were introduced in HiBasic or Basic 3 supplied with the second processor. There are extensions to a number of existing commands, such as List If. The new command Edit has an identical syntax to List, and Time\$ has been introduced in order to display the current reading of the

real-time clock-calendar. The assembler has been modified to accept the enhanced op codes of the 65C02 and now formats assembly listings.

Half of the dynamic RAM of the 128K machine can be addressed as four separate sideways pages or as a contiguous 64K address space by means of new operating-system calls. It is used in the latter mode by a special version of Basic, Bas-128, which is loaded from the Welcome disc and provides almost a full 64K workspace. The penalty for this method of working is that instructions have to pass through a block of memory-management routines, with a consequential reduction in speed.

The Master Series comes with ROM and cassette filing systems: the 1770 DFS for compatibility with previous models, and the double-density Advanced Disc Filing System (ADFS) hard- and floppy-disc controller. Both the ADFS and the Advanced Network Filing System (ANFS) supplied with the Econet interface have a similar hierarchical file structure.

The View word processor, Viewsheet spreadsheet and a straightforward text editor, aimed mainly at the Basic programmer, form part of the machines' standard firmware. The most interesting package, however, is Terminal, which transforms the BBC Master into an extension of whatever computer or distributed-processing system you may choose. The routines are implemented as a language, enabled with a *Terminal command, which gives full access to all of the computer's operating-system facilities while connected to a remote processor via the serial interface. Baud rates and data-word structures can be set up with a *Configure command. Operating modes include ANSI standard Terminal, Teletype and two BBC modes. In Terminal mode the Shifted function keys perform such operations as clearing the screen, toggling the printer, spooling and local/line switching.

The Master Series comes with a Welcome guide and an associated disc and tape. The User Guide contains an introductory description of the features of the computer and clear instructions on how to get it up and running. More detailed information, such as the implementation of BBC Basic and the operation of Editor and Terminal, is now presented in a *Reference Manual* parts 1 and 2, which are available for £14.95 each. Command summary cards are provided for View and Viewsheet but you pay extra for the full manuals.

CONCLUSIONS

■ The Master Series represents the ultimate that can be expected from an eight-bit processor. When the model D arrives it will be based on a complete rethink of the BBC Microcomputer project.

■ Acorn has answered many of the criticisms levelled at the model B, but there are still some features which would be desirable.

■ Acorn's prices are high, but continuity and onwards compatibility are well worth paying for. However, a full set of manuals should be included in the prices.



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COMPAQ PORTABLE II

POWER AND PORTABILITY

By Glyn Moody

The latest addition to the portable range of market leader Compaq looks good enough to threaten even its own top-selling machines.

When IBM launched its PC it left the area of transportable business micros untouched. This gap in the market was noticed and filled very successfully by Compaq, and when IBM produced its own portable it was unable to make any headway against the well-established Compaq machine. Compaq later went on to add desk-tops and portables based on the 286 chip to its range.



SPECIFICATION

CPU: 80286 running at 6MHz or 8MHz
RAM: 256K on floppy-disc machines, 640K on hard-disc version; upgradable to 2.1Mbyte, or to 4.1Mbyte on an expansion board
Keyboard: IBM PC/AT style
Display: 9in. monochrome dual-mode: 720-by-350 text, 640-by-200 graphics
Discs: on or two third-height 360K floppies; or one floppy and one half-height 10Mbyte Winchester
Interfaces: parallel port, serial port, RGB monitor interface, UHF monitor, composite video output
Software in price: MS-DOS 3.1
Hardware expansion: RAM upgrades
Dimensions: 450mm. (17.7in.) x 190mm. (7.5in.) x 353mm. (13.9in.)
Weight: 11kg. (24lb.) with floppy drives, 12kg. (26lb.) with hard disc
Prices: single-floppy version £2,695; hard-disc version £3,795
U.K. distributor: Compaq Computer Ltd, Ambassador House, Paradise Road, Richmond, Surrey TW9 1FQ. Telephone: 01-940 8860
Availability: now

BASIC BENCHMARKS

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Compaq II — 80286	0.3	1.3	3.0	3.0	3.4	6.2	9.6	9.5	4.5
Deskpro 286 — 80286	0.3	1.2	2.8	2.9	3.2	5.7	9.1	9.2	4.3
IBM PC/AT — 80286	0.5	1.9	4.6	4.7	5.2	9.1	14.6	13.5	6.8

The standard Basic Benchmark routines — see *Practical Computing*, January 1984 page 102 — show the Compaq II lagging only slightly behind the much more expensive Deskpro 286. Times are quoted in seconds.

It is therefore slightly surprising that Compaq's latest machine should be another portable based around the 286. Called the Portable II, the new machine fits in between the old Portable, now reduced in price to £1,895 and the top-of-the-range Portable 286. The new machine comes in floppy- or hard-disc versions, with prices starting at £2,695 for the single-floppy machine.

The most noticeable difference between this new machine and the older models is its size: it is considerably smaller and lighter. This alone may make it preferable to the cheaper or more powerful versions. Within this neater package there is a 9in. green screen and two expansion slots, one 16-bit and the other eight-bit. Up to 4.1Mbyte of memory can be made available; expansion up to 2.1Mbyte requires no expansion slot. Standard interfaces include one parallel port, one serial port and various video outputs. In the base of the machine there is a compartment for storing the mains lead, the lid of which doubles as a stand for the computer.

There are some nice design touches. For example, the carrying handle is padded, making the machine much more comfortable to carry. The cavities containing the ports and the expansion boards are accessed via sliding panels on the side of the machine. Also, the coiled lead which attaches the keyboard to the main unit retracts into a hole in the machine when the keyboard is clipped over the bottom of the unit when not in use.

One aspect of the new machine is less welcome. As with most transportables, the keyboard clips on to the front face to act as a base for the unit. Unfortunately, the catches used to hold it there are rather inefficient, and on one occasion the keyboard fell off as I was moving the unit.

The keyboard is modelled on the standard AT layout and has an acceptable feel to it. The text display is quite distinct, but the characters are small and may be a strain to look at for a long time. In most other respects the machine is excellent.

In August 1985 *Practical Computing*

raved over the performance of its predecessor, the Deskpro 286, and by implication the Portable 286. Once more Compaq has made no concessions to quality. The processor runs at 8MHz normally but can be switched to 6MHz if software requires it. The disc performance is also well up with the field, though slightly behind the Deskpro 286.

As far as compatibility goes, the Portable II ran all the standard tests such as Lotus 1-2-3, Sidekick, and even the PC version of Microsoft's Flight Simulator. Apart from MS-DOS, there is no bundled software. The only manuals we saw were the standard Compaq versions for MS-DOS and Basic.

The Portable II goes well beyond the first Compaq portable, and there seems little doubt that it will lead to the original machine being dropped. It is also likely to eat into the sales of the Portable 286, which may be superior but only by a small margin.

COMPAQ PORTABLE II

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 type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

As much power as you are going to need, packaged in a conveniently carryable form.

CONCLUSIONS

■ The mains-powered Compaq Portable II transportable is smaller and lighter than Compaq's previous models.

■ The 9in. screen may be slightly too small for some people. More serious — though easier to correct — is the problem of the keyboard's precarious latches.

■ The Benchmarks show it to be right at the front of the pack, and more than adequate for any computation-intensive purpose.

A photograph of the Statue of Liberty in New York City, set against a dark, stormy sky. A bright, jagged lightning bolt strikes the top of the statue's crown and extends upwards into the sky, forming a shape that resembles the outline of the state of New York. The text "We've taken America by storm." is superimposed over the upper part of the image.

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PCC IV-VIII

MORE FOR LESS

By Chris Bidmead

The price of IBM clones is falling steadily. This fully specified machine with a 20Mbyte Winchester comes at a price which most people expect to pay for an add-on hard disc alone.

For an asking price of just under £1,000 the Surrey-based company Personal Computer Compatible Ltd (PCC) is offering a fully IBM-compatible machine complete with dual-speed 8088 processor, a 20Mbyte hard disc and high-resolution monochrome graphics.

From the outside, the casing of the IV-VIII resembles that of the IBM PC/AT, though it is not as tall. It is fabricated from sheet steel, which is about half the price of the formed aluminium regularly used by brand-name manufacturer but adds considerably to the weight. The review machine carried no logo of any kind; we understand that production machines will be badged with the IV-VIII logo.

The keyboard matches the PC/AT's rather than that of the PC itself. The larger Return key and more typewriter-like layout make it much easier for touch-typists to use. PCC's keyboard is manufactured in Taiwan but the quality of construction appears to be good. There are LEDs to indicate locking of the Caps, Num and Scroll keys, though only the Caps and Num indicators were working on the review machine. The Enter key seemed to be more heavily sprung than the rest.

The monochrome monitor supplied with the machine is manufactured by Tatung and produces an amber display. It was as good as the Olivetti M-24 monitor running its own proprietary high-resolution graphics.

Removing the cover of the system box revealed electronics of a solid, utilitarian quality. The 135W power-supply unit and its integral fan are mounted at the right-hand side of the chassis at the rear, and are well shielded. The unit is not marked as it should be with its operating voltage.

The machine is based around an 8088-2 CPU chip. It can be operated at the IBM-standard 4.77MHz or at a more speedy 7.65MHz. PCC will fit an 8087 maths co-processor as an option into the appropriate slot on the motherboard, which is vacant on the standard machine.

Two separate cages on the right-hand side of the machine house the disc drives. The

half-height 20Mbyte hard disc is sourced from NEC in Japan. The 5.25in. 360K floppy is by Hoshin, a Chinese manufacturer; a second half-height floppy drive could easily be added, as power and data cables are already in place. In fact, PCC supplies both single- and dual-floppy versions of the machine.

Eight slots are provided for standard IBM expansion cards. Two of them are restricted to short cards, and two more are already filled by the disc-controller card and a high-resolution monochrome graphics card. The performance of the graphics card is claimed to match exactly that of the Hercules card, which it resembles physically. PCC also supplies a colour version of the system that includes a colour card.

The machine is supplied with no software at all — not even an operating-system disc.

PCC IV-VIII				
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 type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

Not just a low-cost look-alike but a machine which offers real advantages over the IBM at a price that is a genuine breakthrough.

We were able to boot using a standard IBM DOS 2.00 disc, and the hard-disc formatting and installation utilities Format and Fdisk worked smoothly. We tested the machine with our own copies of proprietary software, configured for the Hercules card as necessary.

Word and PC Paint are among the programs which run satisfactorily. The system-resident program Sidekick also worked without a hitch, as did Microsoft Windows with the Microsoft mouse attached to the serial port. Flight Simulator would not run, as IBM-compatible colour graphics are not supplied with the machine. The AST extended memory card and Dataflex modem we used to test the expansion bus both worked perfectly.

To switch the machine between its two speed modes you press the - key in conjunction with Control and Alt. This choice of keys conflicts with the standard configuration for Sidekick, and perhaps a



SPECIFICATION

CPU: 8088-2 switchable between 4.77MHz and 7.65MHz; optional 8087-2 co-processor

RAM: 512K, upgradable to 1Mbyte

Keyboard: AT-style, no £ sign on key top

Monitor: monochrome amber; optional colour monitor

Display: 80-by-25 text; high-resolution graphics from Hercules-compatible card; colour card optional

Mass storage: one 360K 5.25in. half-height floppy; one 20Mbyte Winchester

Ports: one serial, two parallel

Card slots: six full-length, two half-length

Software in price: none

Dimensions: system box 490mm. (19.3in.) x 415mm. (16.3in.) x 145mm. (5.7in.)

Weight: about 26kg. (57lb.) including keyboard and monitor

Price: £995 plus carriage

Manufacturer: Personal Computer Compatible Ltd, 29 Queens Road, Hersham, Walton-on-Thames, Surrey KT12 5NE. Telephone: 01-979 7921

Availability: now

hardware switch would have been preferable.

At the higher speed the internal software clock is affected, and this is bound to give problems for any standard IBM software making use of this feature. The hardware real-time clock is not affected, but DOS has no way of reading it directly. PCC is providing a small routine called Timer.Com to read the hardware clock and convey the data to DOS at boot time.

No manuals were supplied with the machine. The only documentation was a leaflet to cover the Tatung monitor, a booklet detailing the graphics card, and some photocopied information on a dual-floppy version of the machine. PCC says that proper manuals will be available later.

CONCLUSIONS

■ Considered simply as a piece of hardware, the PCC IV-VIII is a well thought-out, well made machine at an excellent price.

■ The machine appears to run standard IBM software without a hitch.

■ The dual operating speed is a bonus, though some software may not run properly at the higher speed.

■ The absence of any authenticated system software and the sparse, poorly produced documentation supplied for review are not particularly reassuring for those who are wary of buying from an unknown firm.



MACINTOSH PLUS

MAKE OR BREAK

By Ian Stobie

The Macintosh offers the only major alternative in the mass business market to the IBM PC and its numerous clones. Now it has been revamped.

A lot rides on the success of Mac Plus. It is a truly crucial product not just for Apple, but for the whole personal-computing world. If Apple fails with it, the IBM standard will rule supreme in the business market. Even committed IBM users might come to regret the absence of an alternative.

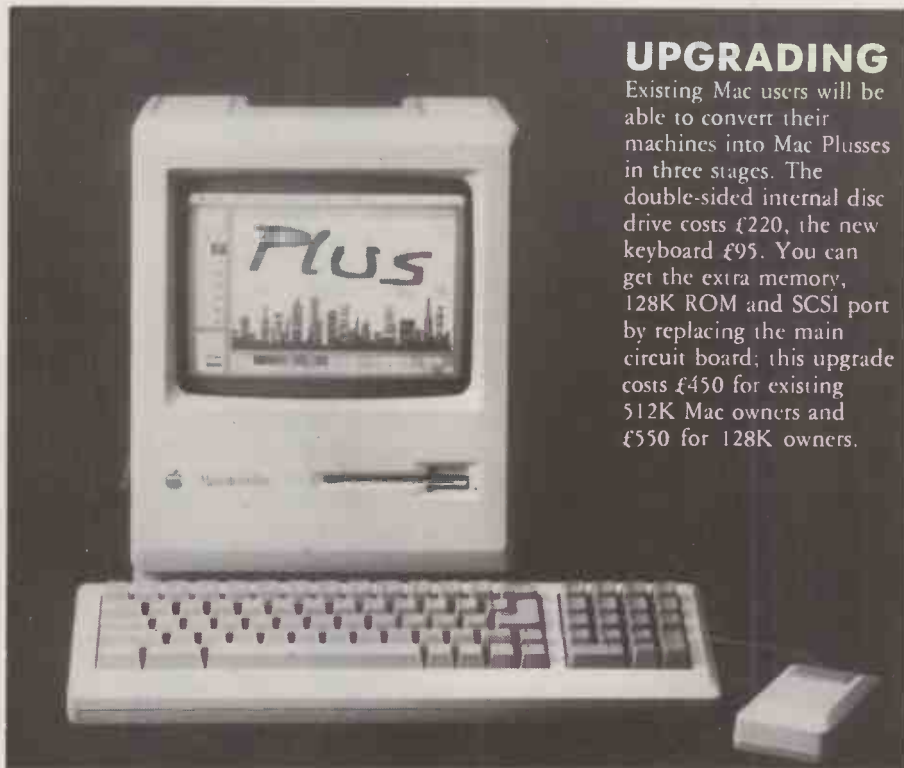
The £2,295 Mac Plus machine is a straightforward revamp of the existing 128K and 512K Macintosh computer. It offers more memory, greater disc capacity and greater speed. It also takes a small step towards greater compatibility with peripherals from third-party suppliers, without going the whole way towards Apple II or IBM-style expansion slots.

From the outside, the Mac Plus looks almost identical to the existing Mac products. The upright off-white system box has the same 9in. monochrome screen in the middle, and the single disc drive is offset to the right beneath it.

The keyboard is the only obvious change. It is wider, with a separate numeric keypad on the right. It also has four cursor-control keys, which are absent from the original Mac keyboard. Both these additions are probably aimed at spreadsheet users. For touch-typing we found the feel a noticeable improvement on the original — it is now very good.

The Macintosh mouse, key to the much vaunted Mac user interface, is unchanged. Apple has stuck with one button on its mouse. Other manufacturers have added extra buttons to their products, but in our view they are unnecessary and make the mouse less easy to use.

Closer examination of the system box reveals an extra interface at the back. The



UPGRADING

Existing Mac users will be able to convert their machines into Mac Plusses in three stages. The double-sided internal disc drive costs £220, the new keyboard £95. You can get the extra memory, 128K ROM and SCSI port by replacing the main circuit board; this upgrade costs £450 for existing 512K Mac owners and £550 for 128K owners.

The keyboard is wider than the Mac's with a separate numeric keypad on the right.

printer and comms ports have shrunk to small eight-pin DIN connectors to make room for it, while the external disc-drive port is retained. We were still able to use our existing Imagewriter printer and Apple modem, using a short adaptor cable, and our existing external drive.

The new 25-pin D connector is an SCSI port, Apple's gesture towards greater hardware expandability. SCSI, the Small Computer Systems Interface, is a high-speed interface, capable of transferring data at up to 320K per second. This makes it particularly suited to hard discs and image-scanning devices. You can connect up to seven SCSI-compatible devices to the Mac's one port, daisy-chaining them together. John Lewell wrote a detailed report on the SCSI

standard in the May 1985 issue of *Practical Computing*. Many third-party suppliers already have SCSI-based hard discs for the IBM which can now be converted quickly to work with the Mac. They should offer performance advantages over existing Mac hard discs built to connect to the Mac's slower conventional disc port.

The Mac Plus's 3.5in. built-in drive is now double-sided, with a total capacity of 800K. It will read your old single-sided Mac discs as well as the new double-sided media. It is also quicker. The Mac desk top comes up in 15 seconds, and most disc operations are at least twice as fast as on a 512K Mac. This is partly due to the extra memory in the machine, which now amounts to 1Mbyte. Apple intends to offer an upgrade to 4Mbyte very shortly, as soon as enough 1Mbit chips are available.

MAC BENCHMARKS

	512K Mac	Mac Plus
Boot Desktop	21	15
Load Macwrite	29	13
Load 5K Macwrite document	16	5
Load 15K Macwrite document	33	6
Load Jazz 1.0	55	30
Load 13K 1.0 worksheet	32	38

The new Mac Plus takes less than half the time to do most disc operations. The RAM cache gives additional speed gains if you are doing repetitive operations on the same file. The Jazz timings are correct; for some reason Jazz was an exception, with some things taking longer. Lotus acknowledges the problem and is bringing out a new release.



An SCSI port is Apple's gesture to greater hardware expandability.

SPECIFICATION

CPU: Motorola 68000 running at 7.8MHz
RAM: 1Mbyte, expandable on board to 4Mbyte
ROM: 128K software to run the Wimp interface
Keyboard: QWERTY with numeric pad and cursor keys
Discs: one 3.5in. double-sided 800K floppy drive built-in; optional external 800K floppy; optional hard discs from various suppliers from 10Mbyte to 120Mbyte
Display: built-in 9in. monochrome screen displaying 512 by 342 dots
Interfaces: two serial ports earmarked for comms and printer, external disc interface, fast SCSI port for hard discs and other devices to which seven devices can be daisy-chained
Dimensions: system box 344mm. (13.5in.) x 276mm. (10.9in.) x 246mm. (9.7in.); weighs 7.5kg. (16.5lb.)
Software in price: Finder 5.1 system with disc cacheing
Price: £2,295, including keyboard and mouse
Manufacturer: Apple Computer Inc. of Cupertino, California; made in Ireland
U.K. supplier: Apple Computer (U.K.) Ltd, Eastman Way, Hemel Hempstead, Hertfordshire HP2 7HQ. Telephone: (0442) 60244
Available: now

Some of the extra memory is now used by the rewritten operating system — called the Finder in Mac parlance — as a disc cache. This makes no difference the first time you fetch something into memory, but speeds things up further on subsequent use of the same file. For example, reloading Macwrite took us eight seconds not 13, reloading a 15K Macwrite document three seconds rather than six, and reloading our test Jazz worksheet eight seconds not 38. You can override the default cache size if you like, but the big advantage of a cache system compared to a RAM disc is that the user does not have to know anything about what is going on, it all happens automatically.

More of the operating system is now held in ROM, and the routines in the larger 128K ROM have been rewritten for speed. Opening and closing windows on the desk top is faster. Scrolling through the scrapbook, even with graphics in it, is virtually instantaneous.

On more substantial applications the changes are less spectacular, being mainly confined to quicker loading and saving. Scrolling through a Macwrite or Jazz file you do not notice any difference. As it stands, Jazz is one of the programs least improved by the Mac Plus, but Lotus is bringing out a £20 update for existing users to make better use of the new facilities.

To run old software on the Mac Plus you need first to run an Install utility provided with the system. This puts the new 5.1 Finder on the disc and allows the software to work with either the old or new keyboards. The only problem we had with a typing tutor, which not surprisingly continued to display pictures of the old keyboard. Other

MACINTOSH PLUS

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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Value for money	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

What the Mac just missed being in the first place — a really excellent personal computer.

software, such as Macwrite, Macpaint, Jazz and Excel, ran successfully on either machine. We now also have the bonus of the disc-cacheing operating system on our 512K Mac.

Apple may have made one mistake with the Mac Plus: Macwrite and Macpaint are no longer included in the price but have to be bought separately for £95 each. This is a shame, because these programs are classics of their type. Perhaps Apple wants to encourage third-party software developers such as Microsoft. It must be hard to sell a word-processing program like Word when all Mac users already have the excellent Macwrite.

What you now get instead is a demo disc which carries crippled copies of Macwrite, Macpaint, Macdraw and Macproject. You also get the system/utilities disc and a tutorial guided tour. The 100-page Mac Plus manual is well presented and easy to understand.

It has always been far quicker to become productive on the Mac than on the IBM PC or other MS-DOS machines. This is partly because of the windows/mouse interface, but also because you have so much less to read before you get started. This philosophy has rubbed off on many Mac software suppliers. They usually try to come up with slim, well-written manuals rather than the

verbose ring-bound reference tomes typical of IBM products. It is always amusing to hear software houses with £400 or £500 products for the IBM justifying their price on the basis that their products are easier for executives to learn. If people's time is worth so much, what are they doing with an IBM in the first place?

But Apple needs more than praise from existing users to stay in business against IBM. People who use the Mac already and recognise its virtues are not the problem. The Mac Plus has eliminated the major faults — basically by being faster — but Apple still has to do something brash and spectacular to shake the business world from its attachment to the IBM standard.

A bigger screen, even more memory and a full 68020 processor would help. Maybe people would take notice if the Mac were really incredibly fast. But Apple has a marketing problem: how does it convince people that the Mac is a practical machine as well as a stylish one?

The biggest mistake Apple could make would be to make the Mac software compatible with the IBM, either with an add-on card or perhaps by the sort of software emulator available with the Amiga. If you could run IBM programs on the Mac, few software houses would bother writing directly for the Apple machine. Without software written specifically to take advantage of the Mac's remarkable interface, the machine becomes just another rather expensive clone.

Apple is looking increasingly beleaguered in its attempt to present an alternative to the IBM way of doing things. Last year turnover was down nearly 25 percent, although Apple is still a financially strong company with healthy profits. But as more and more manufacturers jump on the IBM bandwagon Apple has to do something to sustain the Macintosh.

The real strength of the Mac is its software. Apple should concentrate on providing hardware which shows off the existing Mac software base to best advantage, and which also tempts software houses to continue writing for the machine. The Mac Plus may not do the trick in the longer term, but it might keep the Macintosh show on the road.

CONCLUSIONS

- The Macintosh has always been an easier machine to use than the IBM PC. Now it also offers better performance: the megabyte of memory, disc cache and higher-capacity disc drive speed things up very noticeably.
- You still need to buy a second disc drive to get the best from the machine.
- The addition of an SCSI port means that many third-party discs will shortly be available for the machine. Apple's own 20Mbyte Hard Disk 20, which connects to the slower disc port, is unlikely to offer better value.
- Existing Mac software seems to run without difficulty; 128K and 512K Mac owners can upgrade their hardware to the new Mac Plus specification in easy stages.
- At around £2,500 for a twin-drive system the Mac Plus is not really cheap enough to win a massive following among U.K. users. **PC**

PARADOX

COMPLEX BUT EASY?

By Mike Lewis

Flexible database packages like dBase III are difficult to use to the full. Ansa's package offers an equal capability but uses the technique of query by example to make report generation and on-screen querying easier for the user.

A paradox is an idea which seems to conflict with conventional logic; something that your senses tell you exists, but which your reasoning insists cannot. According to the Ansa Software Corporation, a computer program would be a paradox if it had enormous power, sophistication and flexibility, but was still quick to learn and easy to use.

These are precisely the claims that Ansa is making for its new database-management package; hence the name. So does Paradox really achieve something that was hitherto thought impossible, or is it just another run-of-the-mill filing system?

Certainly, Paradox is sophisticated. After three weeks of fairly intensive use, I feel I am still scratching the surface of this complex product. On a straight feature-by-feature comparison, it seems to be ahead of most of its rivals, and it would be a very ambitious user that managed to push it to its limits.

But ease of learning is another matter. The basic concepts are not hard to grasp, but getting to grips with the full functions of the package can be a daunting task. The manuals are good, but there is inevitably too much in them to absorb without long, careful study: some 840 pages in five books. It took me a full day just to skim through the main user's guide.

When I finally felt ready to boot it up, the first thing that hit me was its remarkable resemblance to Lotus 1-2-3. Paradox has the same type of top-line menu, with sub-menus and options selected by means of the left and right arrow keys. As with 1-2-3, each choice is accompanied by a short explanation, and the whole thing is linked to a set of context-sensitive help screens.

LOTUS-LIKE DISPLAY

The rest of the display also has a Lotus-like feel to it, except that it is centred around a database instead of a spreadsheet. Not that the term "database" is used very much in Paradox — Ansa prefers to call it a table. This reflects the two-dimensional view that the user has of the data, with rows equating to records and columns to fields.

You can have several of these tables on-screen at a time. Paradox itself decides where to place them and how they overlap, although you can, with difficulty, juggle them around a bit yourself. You can also

rearrange the columns, alter their width, and generally pretty things up according to your taste. But all these changes merely alter your view of the data; the actual files remain the same.

For those who prefer looking at a single record at a time, you can switch to a form view. As you page through the forms, the table scrolls in harmony, in much the same way as in Borland's Reflex. But unlike Reflex, Paradox does not allow you to see both views at the same time.

FEW RESTRICTIONS

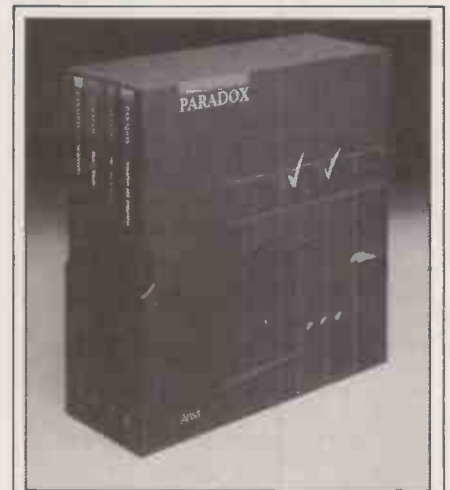
You can design up to nine forms for each table. There are virtually no restrictions on what can go in a form, including boxes, borders, highlighted fields and background colours. Each table also has a fairly bland default form, for those who do not want to make their own. In fact, many users might manage without forms completely, since most of the driving of Paradox is done through the tables.

For example, data can be entered directly into a table, and also edited there. The editing capability is surprisingly limited: you can normally only add or erase characters at the end of a field. A special mode is available for slightly more sophisticated alterations, but this attaches different meanings to many of the keys. For example, the Del key deletes a single character, whereas at other times it erases an entire record.

Having entered your data, you can move on to one of Paradox's more interesting features: the query. Queries can be used to extract, combine and manipulate data in a huge variety of ways. They go far beyond simple table searches, and are very much at the heart of the whole Paradox concept.

The simplest queries work on one table at a time. You start with a special query table, which contains the same column headings as the main table, but no data. You put your search criteria into this table, and you can also tick any of the columns to indicate which fields you want to view. The ticks appear on the screen as square-root symbols, and are entered via a function key.

The results of the query are presented in a new table, called Answer. This behaves just like any other table, in that you can edit it, produce reports from it, or even carry out



SPECIFICATION

Description: relational database with strong reporting and querying features; also includes the PAL applications development language
Hardware required: IBM PC or compatible with at least 512K RAM and MS-DOS 2 or later; a hard disc is strongly recommended
Copy protection: one copy only can be installed, but this can subsequently be un-installed; a non-copyable backup floppy disc is also supplied
Price: £550
Publisher: Ansa Software, Belmont, California
U.K. distributor: P&P, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744. Softsel, Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866
Available: now

further queries on it. The only difference is that it is automatically deleted when you perform a fresh query, or when you exit Paradox. You can, however, change its name and explicitly save it if you wish.

You can also query several tables at the same time, provided that they have at least one field in common. This link field is identified by a technique which crops up often in Paradox: query by example. The idea is borrowed from an IBM mainframe package of the same name.

Using query by example in this case

↓ [F6] to include a field in the ANSWER; [F5] to give an Example Main

PHOTOLIB	Reference number	Subject	Category	Type
1	1222	Muncaster Fell	mountain	tran
2	1335	West York. dmu	railway	b/w
3	1410	ECML 125	railway	cran
4	1720	Grosport Station	railway	b/w
5	1722	NYMR overview	railway	b/w
6	1732	NYMR stock	railway	b/w
7	1890	River Dart	country	tran

ANSWER	Reference	Subject
1	1335	West York. dmu
2	1410	ECML 125
3	1720	Grosport Station
4	1722	NYMR overview
5	1732	NYMR stock
6	3401	Class 47s

A simple query, using a table called Photolib. The results appear in the Answer table.

↓ [F6] to include a field in the ANSWER; [F5] to give an Example Main

PHOTOSAL	Photo reference	Customer reference	Rights sold	Date of sale	Value of
1	1222	MN4	all	1/15/86	45
2	1298	MY3	all	12/02/85	30
3	1720	RWPI	first	2/15/86	30
4	1722	RWPI	first	2/15/86	30

PHOTOLIB	Reference	Subject	Category	Type
1	1234	Muncaster Fell	mountain	tran
2	1234	North Downs	country	tran
3	1234	River Dart	country	tran

A query involving two tables. An example value is used to identify the common field.

Restructuring Photosal table

STRUCT	Field Name	Field Type
1	Photo reference	A4*
2	Customer reference	A4
3	Rights sold	A6
4	Date of sale	D
5	Value of sale	N

FIELD TYPES

- A: Alphanumeric (ex: A25)
- Any combination of characters and spaces up to specified width. Maximum width is 255.
- N: Numbers with or without decimal digits.
- \$: Dollar amounts.
- D: Dates in the form mm/dd/yy or dd-mon-yy.

Use "*" after field type to show a key field (ex: A4*).

A special table used for creating or restructuring other tables. Note the four field types that are allowed.

Designing report R1 for Photolib table

Table Band

.....10.....20.....30.....40.....50.....60.....70.....8*

-----page-----

List of unsold transparencies (all categories) Page 999

Reference	Subject	Category	Type	Date taken	Comment
AAAA	AAAAAAAAAAAAAAAA	AAAAAAAAAA	AAAA	dd-Mon-yy	

-----page-----

One of the screens used for designing a tabular report.

involves entering a certain value in each occurrence of the linking field. The actual value is immaterial; it is merely an example. The important point is that the same value is used each time. This might at first sound like a long-winded way of pointing to a table column, but it is indispensable for some of the program's more powerful features.

As well as search criteria, a query table can contain formulae, group operators like Average and Count, and instructions such as Insert and Changeto. These are not particularly easy to use, but they do enable queries to be applied to such tasks as global file updating, posting transaction to a master file, and much more. Fortunately, there is also a simple Find command, which can be used to go quickly to a specified record without the overhead of creating an Answer table.

Despite its undeniable sophistication, even the query function does not match the capability of Paradox's other major feature, the report generator. In fact, this is probably the most powerful report generator in any database manager I know, including such heavyweights as Reflex and Rbase 5000.

A report can be tabular, free format, or a combination of the two. You use a full-screen editor to play around with the various elements that make up the report, such as field values, margins, page breaks, headings and any other text. As with so much of Paradox, the process can be tricky to learn, but there seem to be no limits to what can go into a report and how it is to look.

If all this sounds like hard work, you can use instead a standard tabular or free-format report layout, which is pre-defined for each

table. Easier still, there is a function called Instant Report, which sends a selected table to the printer at the touch of a function key. One problem with this is that it is a easy to start up by mistake, and there is no way of cancelling it once printing has started.

Like most self-respecting packages, Paradox can import data from other programs and formats, including Lotus 1-2-3, dBase II and III, PFS File, VisiCalc, and ordinary ASCII. Unlike many others, it can export to these formats as well. It also has functions to copy, rename and delete tables, and to move to other MS-DOS directories. Surprisingly, it is not possible to run an external program.

Paradox does have some annoying quirks. For example, the division of labour between the top-line menu and the function keys leaves something to be desired. If you want to rearrange the tables on the screen, you can press f8 to remove the current table, but you have to resort to the menu to redisplay it elsewhere. In fact, most of the options connected with how tables are viewed on the screen could be speeded up if better use were made of the function keys. Keyboard macros — which Paradox calls scripts — provide a partial solution to this.

BACK TO THE MENU

Another difficulty is that Paradox has a prodigious appetite for disc space. Many of the functions result in temporary tables being set up, like the Answer table after a query. When you enter new records, they are not placed in the main table straight away, but are stored in another table, called Entry, until you are ready to transfer them.

This approach has several advantages. It makes it easier to check and correct the new data, and it means that your typing is not held up by constant updating of indexes. But it does require extra disc space, albeit temporarily, and it also results in more swapping between disc and RAM, which in turn slows things down. Paradox is fast enough when dealing with low volumes, but it tends to be fairly sluggish with tables that contain several hundred records.

Perhaps the worst problem with Paradox is the screen display. Every time that the program outputs anything to the display, even a single character, it develops an extreme case of screen flicker, of the type you see when data is written directly to the video memory. This has at times been so severe that I have been tempted to stop using the package.

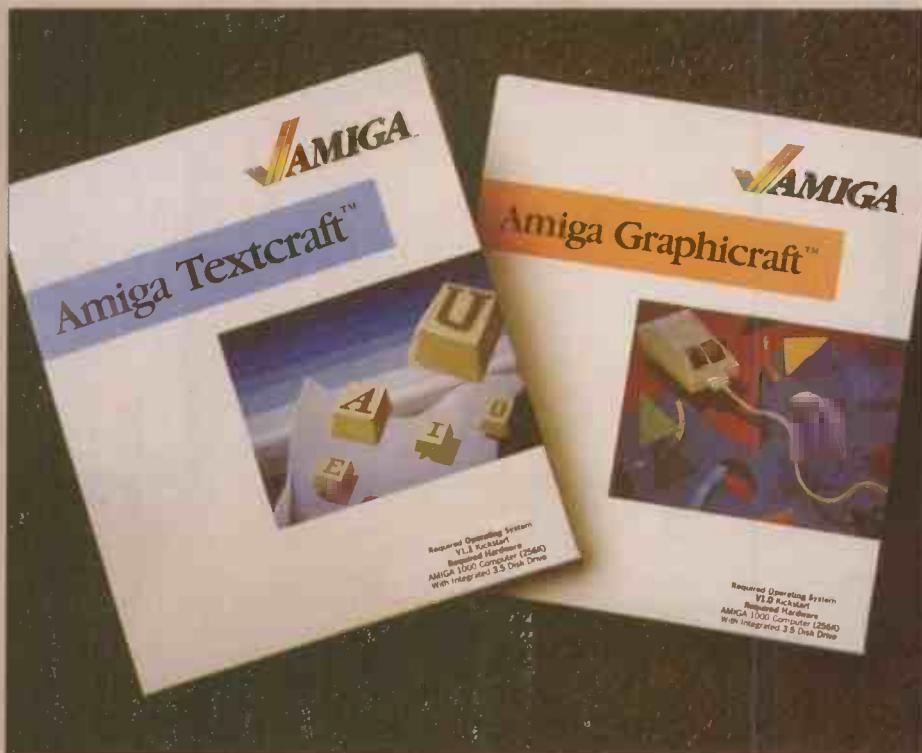
On a more positive note, Ansa deserves a pat on the back for its manuals. They are clearly written, packed with examples, and relatively free of jargon. Finding your way round the main user's guide is especially easy, thanks to a running head which duplicates the software's top-line menu.

Inevitably, a package of the size and complexity of Paradox has many more features that can be described in this short review. I have not even mentioned the Paradox Application Language, a true programming language which puts all the sophistication of Paradox into the hands of application developers. PAL comes free with Paradox, and is a pretty remarkable piece of software in its own right. It is a subject to which I shall be returning next month, in the second part of this article.

AMIGA SOFTWARE THE FIRST WAVE

By Glyn Moody

Software for Commodore's Amiga has been scarce so far. Now three new programs show off the machine's graphics capabilities and its potential for user-friendly operation. But will they be enough to keep it abreast of its rivals?



Commodore's Amiga computer was first announced at the end of July last year, and *Practical Computing* previewed the machine in October. Since then Commodore's financial position has grown more precarious, and there is little sign of huge sales of the machine being clocked up which might turn the company round. This is partly a result of the low-key sales drive; mostly it has to do with the current availability of software.

Although the machines themselves have been available, software has been a rarer commodity. And what software there was, such as the Basic from Bristol-based Metacomco who wrote the operating system, has proved rather unstable. Against this background, the imminent release of three Amiga programs from Commodore is all the more interesting.

Two of the programs form part of a projected core of software designed to cover all the main applications such as word processor and spreadsheet. The other package is from a third party.

Two of the packages are graphical, which is not surprising given the Amiga's superb graphics capability. It is put to good use in the first of the packages, Deluxe Paint from Electronic Arts. The on-screen appearance of the product is familiar. It draws heavily on

the pull-down menu and mouse approach used by the Amiga, and more specifically on programs like Apple's Macpaint. A palette bar down the side of the screen provides the main drawing tools, which deal with functions like freehand drawing, air-brushing, drawing with rectangles, circles and arcs, and shape-filling techniques. Pull-down menus handle more advanced functions.

DISTORTED IMAGES FOR SPECIAL EFFECTS

The obvious difference between the Amiga and the Mac is that the Amiga uses colour. Another difference is that on the Amiga the brush used can be almost as important and complex as the final picture itself. Any picture or part of a picture can be used as a brush. This allows all kinds of special effects, as images are literally spread across the page. Similarly, brush images can be reduced, enlarged, inverted, rotated, sheared — to produce a slanting version — or bent. So, as in the example opposite, a rectangular image can be curved and distorted to produce a kind of visual cylinder.

Most of these operations are handled by pulling down one of the menus along the top of the screen using the right-hand

button on the mouse. Any of these modified images can be used as a brush; the production and movement of such complex shapes in real time is impressive.

You have complete control of all the colours, both in the brush and in the rest of the image. Colours are mostly accessed from the colour palette box, but Deluxe Paint adds a few impressive options. For example, the Smear command mimics the effect of smudging paint with your finger. Blend and Shade depend on the previous definition of a set of colours, which are then regarded as adjacent. This is achieved from the main colour palette box by defining two end points from among the 32 colours which may be on-screen simultaneously; the shades in-between are then taken as a sequence.

The Blend effect produces a kind of average as it passes over colours from within that sequence. The Shade command changes each colour it passes over to the next highest or lowest in the paint set you have defined, depending on which mouse button you press. If your paint set consists of a series of, say, greys, the shading would have the same effect as using a pencil to darken an image, or a rubber to lighten it.

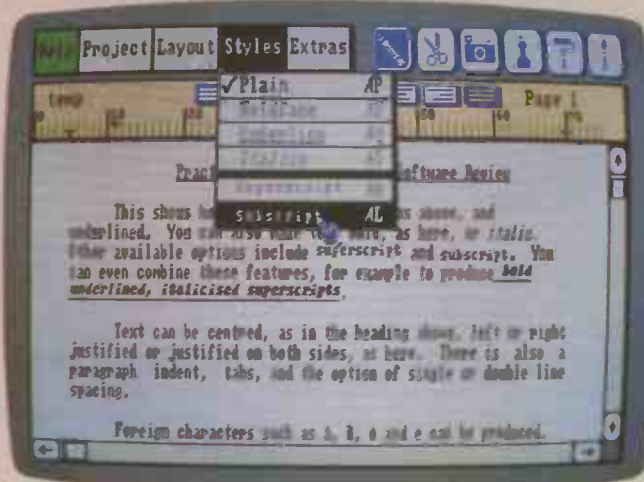
Sets of colours of this kind are used in two other unusual features. Using one cycle of



The Deluxe Paint colour palette box lets you change the 32 on-screen colours and the colours the brush cycles through.

Textcraft's screen resembles that of Macwrite. You select type style from the pull-down menu, and other functions from the icons.

Graphicraft displays a palette box similar to Deluxe Paint's, though cruder, and a more limited brush selection.



shades, you can draw with a brush whose shade changes regularly and cyclically as you move along, producing a stippled effect. The same sets of colours can also be used for simple animation. You can get on-screen colours to move through a set at a variable speed. If the set consists of related colours — say, light and dark blues — and they are used to represent water, the overall effect is

of movement. Up to three independent sets of colours can be defined for each picture.

The final novel set of commands concerns how images are built up on-screen. Using the Symmetry option you can set up multiple virtual mirrors. As you draw, every line is multiplied to produce kaleidoscopic patterns. A variant on this is the use of cyclic symmetry. Instead of reflecting as in a

mirror, each repeated image is an exact copy but turned through an angle about the symmetry point, which you can change.

For one of the first products to come through on the Amiga, Deluxe Paint is impressive. It shows many of the Amiga's strengths to good advantage. The main problem is that for it to be useful in a business context you would need to invest in

(continued on page 71)

XT-Compatible 20 Megabytes

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(continued from page 69)

a fairly expensive colour printer. Even then the lower overall quality of the output compared to full-blown professional paintbox systems remains a limiting factor. Nonetheless, either as an introduction to some of the latest graphic-manipulation techniques or as a low-level paintbox-type program it looks to be good value.

Deluxe Paint is let down by a skimpy manual. Like all the programs covered here, its U.K. price and distribution details have yet to be finalised. In the U.S. it costs \$139. Electronic Arts also has Deluxe Video Construction Set under development, which incorporates an extensive set of animation facilities.

It is unfortunate that Commodore's own Graphicraft should have to compete against Deluxe Paint, a program with which it has much in common but which it consistently fails to match up to. There is the same menu bar along the top, with often identical commands. Colours are changed from a main colour palette, but where Deluxe Paint offers you full control, Graphicraft skimps. As well as producing standard shapes like circles and rectangles, it allows you to define your own, but the range is circumscribed compared to the freedom offered by Deluxe Paint. In particular, the impressive operations which can be carried out on brushes are totally lacking.

CHEAPER AND SIMPLER

More exotic effects like mirrors and cycle drawing are present but in a cut-down form compared to the other package. Clearly, Commodore wanted a graphics package available from the start to show off its machine; the simultaneous appearance of Deluxe Paint must be rather a mixed blessing. Certainly there is little reason to buy Graphicraft now except possibly its price, which is only \$50 in the U.S.

Happily the same is not true of the companion program, Textcraft. This is a very presentable word processor written by Arktronics for Commodore. Arktronics was responsible for an interesting but expensive integrated package called Jane, reviewed by *Practical Computing* in July 1984. The abiding impression left by Textcraft is how pleasant it is to use. From the on-screen appearance, with some clever use of pseudo-three-dimensional effects, to the choice of colours, it is evident that much thought has gone into making the program as easy to use as possible.

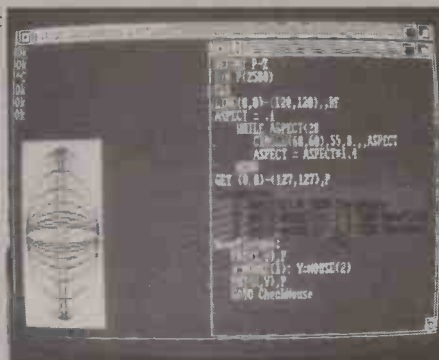
Once more a debt to the world of the Mac and Macwrite is clear, particularly in the use of rulers and scroll bars. But there are also a number of borrowings from Jane. For example, icons are used to represent some operations: scissors denote cutting, a camera represents copying and a glue pot represents pasting. They are used very naturally. For example, to cut a passage, you exchange your pencil icon for the scissors icon by clicking over it; then you click with the new icon at the beginning and end of the text, and the offending passage disappears.

Some aspects of on-screen appearance are

ABASIC

Commodore has replaced the original Basic from Metacomco, which was offered as a stopgap measure, with a version from Microsoft. The new product was originally commissioned for the Amiga but did not make it in time for the launch. It seems to be a straight porting across to Microsoft's earlier Basic for the Macintosh. For example, it makes unusual use of pull-down menus with Basic. It also allows you to have two windows open: one for the output of a program, the other for the listing. This is useful for debugging. While proceeding through a displayed program stepwise, you can also look at the output. Large sections of the manuals are identical.

Perhaps its most interesting new feature is the Say command for converting phoneme codes into words spoken with varying intonation, and the Translate\$ command for turning English words into phonemes. As with some other advanced Basics, line numbers are optional.



Basic listing and program output are displayed simultaneously.

One slightly worrying feature of the Basic supplied for review was that although around 250K was free on the machine, only 25K of that was available for Basic programs, which seems parsimonious in the extreme. Presumably Commodore will get round this limitation.

BASIC BENCHMARKS

	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Av.
Amiga — 68000	0.5	1.9	4.0	4.7	5.0	5.0	13.8	18.1	6.6
Atari 520ST— 68000	0.9	2.8	5.8	6.5	7.2	13.7	20.4	9.2	8.3
IBM PC— 8088	1.3	4.8	11.8	12.2	13.4	23.6	37.6	36.6	17.7

The standard Basic Benchmark routines — see *Practical Computing*, January 1984, page 102 — put the Amiga ahead of the Atari 520ST. All timings are in seconds.

handled just as simply. You choose between right and left justified text by selecting the appropriate icon on the ruler as in Macwrite. Similarly, page width is set by sliding small markers along the ruler. Page size can also be changed from one of the few pull-down menus. The other menus handle matters like file management, headers, footers, page numbering and founts. The founts are fully WYSIWYG.

One limitation of the program is that you cannot incorporate page numbers into headers or footers, only on the next line to them. Another fault is that when saving files which already exist, the program does not check that you want to overwrite.

READY-MADE FORMS

Otherwise, Textcraft does most things you could ask of a word processor, and it does them very efficiently. An added bonus is the provision of various ready-made forms, including business letters, memos, reports and CVs. When you open a new file you are offered the choice of using one of them or starting from scratch. You simply fill in the relevant sections of the forms.

Textcraft is an excellent introduction to word processing which also functions adequately for serious users. The manual is well written and clear. The price is \$100.

There is no doubt that a considerable quantity of Amiga software will soon be available. In addition to the members of the Craft series reviewed here, Musicraft and

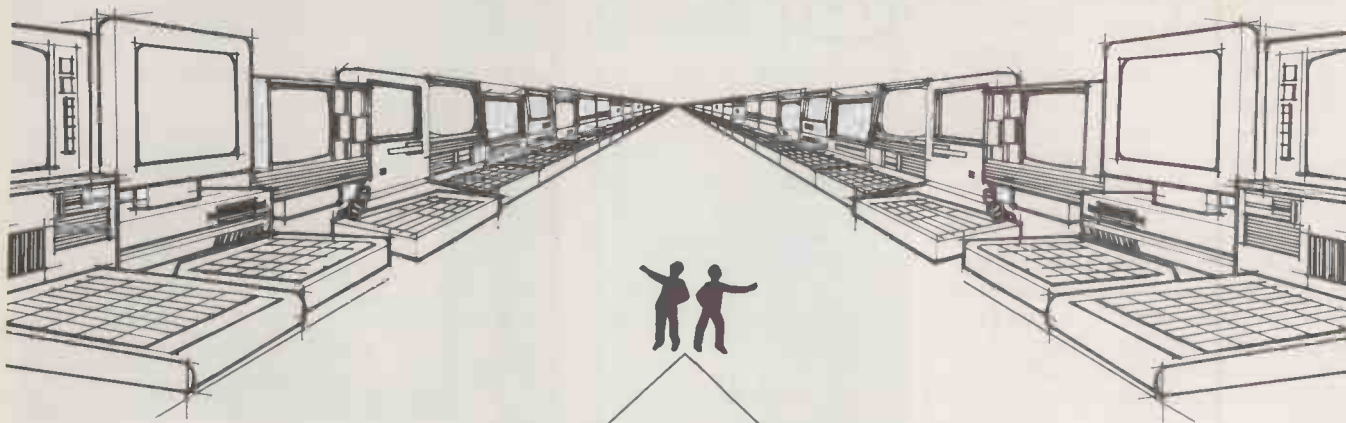
Calcraft are on the way. In the U.K. many software houses are working on products. One which is probably further ahead than most is Guildford-based Taurus Impex with its Acquisition database.

Of the other firms engaged in writing for the Amiga, many have chosen to go for specific vertical markets rather than generic packages. For example, personal publishing has attracted a number of people — presumably because the graphics capabilities of the machine are such a strong factor in its favour. There are also several comms packages in the offing.

The programs we have looked at here are very much in the nature of the first wave. It would be rash to judge the machine's chances on the basis of them. It is worth noting — and applauding — that Commodore is going some way to encouraging a common data format to allow files to be swapped between similar programs. One advantage of this is that it will allow you to take input from video cameras and then manipulate them in packages such as Deluxe Paint.

But two big question marks still hang over the Amiga. First, will enough programs come through to make it a viable alternative to the established names? Secondly, will enough of that software utilise the special features of the machine and provide an incentive to buy it? The success of not only the Amiga, but also of Commodore itself, hangs on the answers. PC

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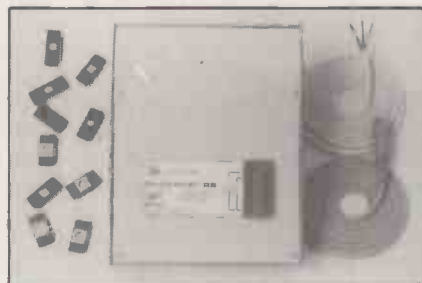
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PFS WRITE

CHEAP BEST-SELLER

By Susan Curran

An anglicised version of this successful program enters the hotly contested market for easy-to-use IBM word processors.

In America, PFS Write has established an enviable reputation as the leading cheap IBM word processor. Software Publishing Corporation is now launching a U.K. version alongside most of the other members of the PFS series.

The PFS Write program is packed on to a single floppy disc, so there is no need to swap discs even to use the spelling checker. The disc can be backed up once only, and the program can be installed on a hard disc up to five times.

The clearly written spiral-bound manual devotes an admirable amount of space to things that might go wrong. It is well orientated towards beginners, and I found the program very easy to learn. There is no keyboard overlay, but pressing the Help key invokes a menu-type display during normal editing.

Selecting Type/Edit from the opening menu leads you straight into the editing screen. It is ruled off like the edges of a piece of paper at the top and sides, and includes a ruler system area at the bottom. The paper metaphor carries through to the reproduction of top and bottom margins, and of headers and footers on-screen. Justification and line spacing are not reproduced on-screen. Double spacing can be ordered on print; for other spacings you have to fiddle about with Escape codes.

Most commands are handled via the function keys, alone or with Shift. Printer-control sequences, forced page breaks and so on are invoked by typing narrative commands on-screen, rather like WordStar dot commands. No other control characters are visible in the text. I found this a mixed blessing, as I had a great deal of trouble removing unwanted indents.

The cursor commands are handled by a rather unhappy mixture of the function keys and cursor keys. Left-arrow moves a character left, for example, but you use F3 to move a word left. There is a passable selection, though a Goto command to a specific page in the middle of a long document would have been useful.

The program responds fast and well on-screen. The text reformats instantly after insertions and deletions, and cursor move-

ment is quick. The sideways scroll for wide documents is a little on the slow side.

Page breaks are adjusted dynamically, but margin changes are handled by a separate Define Page option from the main menu, not on the editing screen. The program pauses for a few seconds to readjust margins before presenting you with the revised document. Only one set of margins can be selected for a document, though it is possible also to order temporary indents. If you want to reformat indented text you have to do it manually by deleting spaces.

Print enhancements such as bold type or underlining can only be handled by selecting blocks of text that have already been typed. As a result, it is a process to underline a single word.

The default mode is overtyping, with a full push-forward insert mode available as an alternative. PFS Write does not let you insert tabs in insert mode.

The usual block move copy and delete operations are neatly and quickly handled by highlighting blocks. The block buffer survives saves and reloads, allowing blocks to

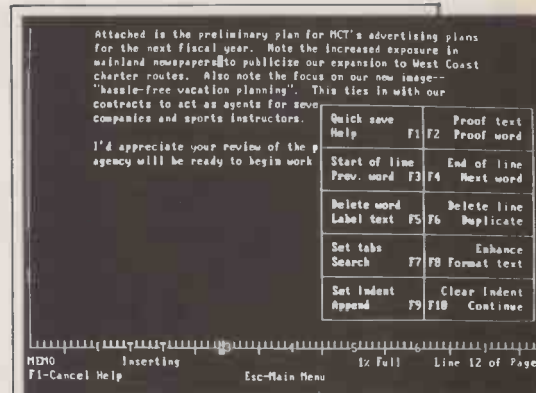
PFS WRITE				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Documentation	<input type="checkbox"/>	<input 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 best all-rounder among the cheap word processors.

be moved from one document to another. Deleted blocks can be recalled immediately afterwards. The manual hints at a limit on block size, but it stretches to several pages.

The program will handle two headers and two footers, though pages can be numbered only at the foot. There is no footnoting or indexing capability.

The spelling checker works fast. It offers alternatives for misspelled words, but they are not always helpful. For example, the program flagged "recognise" and offered "reconcile" and "reconsider" as alternatives, rather than "recognize", which it accepts in its own right. You can set up a user dictionary, but the main dictionary cannot be edited. If you want multiple user



Pressing F1 calls up an on-screen Help window which places itself on the opposite side of the screen to the cursor position so as not to obscure it.

SPECIFICATION

Description: low-cost word processor with built-in spelling checker

Hardware required: MS-DOS, IBM PC, PC/XT or PC/AT with 256K RAM; Apple IIe, Apricot F1, F2 and F10 with 128K RAM

Copy protection: program disc may be backed up once only

Publisher: Software Publishing Corp., 85-87 Jermyn Street, London SW1Y 6JD. Telephone: 01-930 0138

U.K. suppliers: First Software, Intec 1, Wade Road, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 463344. Softsel Computer Products, Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866

Availability: now

dictionaries they can only be handled by constantly renaming files.

Other features include a standard Search/Replace which doubles as an individual word counter, and a decimal tab. Micro-justification is supported on most of the printers handled. Another useful print feature is the intelligent Envelope Print command, which locates the address on standard-layout letters and prints it in a suitable position on an envelope. Among the omissions are column capabilities, background printing, automatic hyphenation, and automatic backing-up of files. Mailing is only available with PFS File.

CONCLUSIONS

■ PFS Write is a neat, fast-working word processor.

■ Its facilities are fairly basic, but adequate for most occasional users of WP.

■ It is exceptionally easy to learn.

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IBM COMMS MAKING THE CONNECTION

By Jack Schofield

The latest modems and software go a long way towards shielding users from the painful intricacies of micro communications.

In America, the Hayes Smartmodem is to computer communications what WordStar is to word processors and Epson is to printers: the standard. But shipping a modem from the U.S. is not as easy as exporting a piece of software. For a start, the frequencies necessary for Bell telephone lines are not the same as the CCITT European standards used in Britain. Further, all modems have to be officially approved before they can be legally connected to the U.K.'s telephone system. Thus the arrival of the Hayes Smartmodem has been somewhat delayed, but it is here now.

In its absence a number of British modems have become established. Perhaps the most interesting among them is the PC Communications Breakout ADM-8 modem, at heart a Jaguar, and formerly known as Missing Link. I tried both the Hayes Smartmodem with Smartcom II software for the IBM PC, and the Breakout modem with both the Breakout and Crosstalk software supplied with it. As Crosstalk is, like Smartcom II, an American package, I also looked at Datatalk from Datasoft.

The major advantage of PC Communications' Breakout is that it comes on an expansion card which fits into an empty slot inside an IBM PC or compatible. I used it in an Olivetti M-24. Once it is installed, there need be no indication on your desk that you have a communicating PC. The only sign of the modem's presence is the thin telephone wire which runs from the back of the computer to the jack plug on the skirting board. You do not need an IBM asyn-

chronous communications card inside the PC. There need be no telephone, no visible modem, no wires, no clutter. The disadvantage is, of course, that once the modem is installed it is not convenient to move it around for use with a different machine.

The U.S.-made Hayes Smartmodem is more conventional in appearance, with the electronics packed into a low metal case. It seems very tough. A row of eight light-emitting diodes is provided on the front to show communications taking place. The Smartmodem requires three connections. First the hard-wired line goes to the telephone jack, as before. In addition a cable has to be run from the RS-232C port on the back to the serial port of the micro being used, while the power transformer makes the link to the mains.

SINGLE SPEED

There is no extra phone socket where you can plug in your telephone handset for voice calls, as with many manual-dial modems. Nor are there any other knobs and switches on the Smartmodem, except for the on/off switch on the back. There are no setting dials as it offers essentially a single communication speed. Also, the configuration switches are behind the front panel, which you to lever off with a screwdriver should you need to change them.

The Breakout is a multi-standard modem which offers CCITT V-21 300/300 full duplex and V-23 1,200/75 full duplex which can be reversed to 75/1,200. In

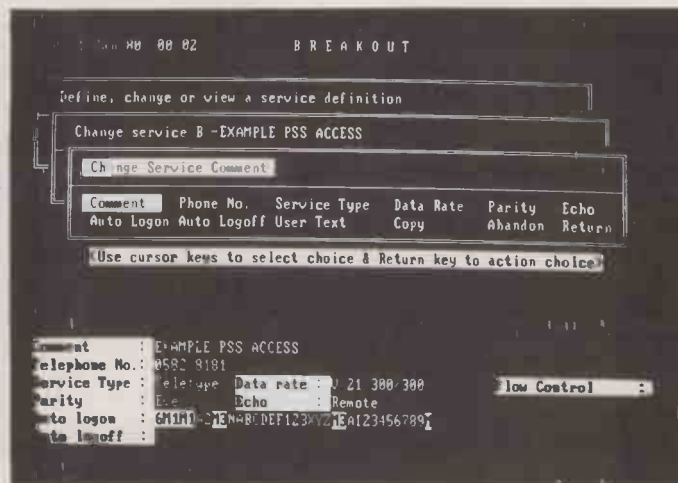
addition it also offers American Bell 103, which is 300/300, and a 1,200/1,200 half-duplex setting. The V-21 300/300 speed is suitable for most bulletin boards, electronic-mail systems and databases. The 1,200/75 speed is used for Prestel and similar viewdata hosts. The 1,200/1,200 half-duplex speed is actually of little or no use, though you might be able to use it to transfer files between your machine and another similarly equipped micro.

Breakout also offers automatic dialling and automatic answering. It can handle pulse or tone dialling, which may be an important factor in ensuring compatibility with your office PABX. Pulse dialling is the type done with a rotary dial; tone dialling is usually done with a keypad.

The Hayes Smartmodem 1200 offers 1,200/1,200 full- or half-duplex operation, autodialling and auto-answer features, and handles pulse- or tone-operated telephone systems. The 1,200/1,200 full-duplex operation is, of course, the main thing you are paying for when you hand over the high price of a Smartmodem 1200, rather than getting a cheap V-21/V-23 job like the Minor Miracles WS-2000. The 1,200/1,200 speed is useful for most of the major database systems reachable via PSS, British Telecom's Packet Switch Stream service. It enables data to be uploaded and downloaded four times as fast as a 300/300 modem, thus cutting down on the costs of both the connect time and the telephone call. However, there are limitations, as follows.



Smartcom II is menu-driven and comes set up with a directory.



Breakout has a tree-like structure of overlapping windows.

(continued on next page)

(continued from previous page)

First, 1,200 bits per second (bps) is only useful for uploading and downloading files. Few typists can manage more than about 60bps when typing on-line, and few people can read data arriving at much more than 300bps or 30 characters per second. Second, if the major application is downloading data, then a 1,200/75 connection is almost as good. The slow 7.5 characters/second back channel is not a problem unless a lot of data is being uploaded. Third, some on-line hosts charge extra for the connection at 1,200 baud, which mitigates the cost savings somewhat.

However, the 1,200/1,200 speed does come into its own for heavy users and where, for example, large amounts of data have to be uploaded. For example, a whole 360K IBM PC floppy full of data would take over 12 hours to upload at the Prestel speed of 75 baud, but at 1,200 baud only about 50 minutes. For such users, the extra cost of a

SMARTMODEM/SMARTCOM

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 type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

The combination works well but the 1,200-baud option is not attractive at the price, except to heavy data users.

1,200/1,200 full-duplex facility will soon pay for itself.

Another advantage of the Hayes Smartmodem range is that many American software packages are set up so that they automatically send the correct control codes to operate the Hayes unit. This is particularly helpful for people working with large integrated packages, rather than those who boot a separate comms package whenever it is required.

Smartcom II is a separate communications package which is optimised for use with the Hayes Smartmodem. It can be used with other modems and IBM PC compatibles, or MS-DOS machines with at least 192K of RAM. It comes in a substantial ring binder with outstanding documentation.

The package's main features are that it offers auto-answer, autodial and auto log-on facilities, Hayes and XModem protocols and a macro facility. The program can store 25 phone numbers and 26 sets of comms parameters — the extra default set is loaded on booting up. VT-100 and VT-52 terminal emulation is provided for connection to minicomputers.

Smartcom II is menu-driven, and comes set up with a communications directory which includes a few of the more popular services: Telecom Gold, Telecom Gold PSS, Knowledge Index/Dialog PSS and Nexis. These services are described in the manual.



SPECIFICATIONS

HAYES SMARTMODEM 1200
System requirement: async RS-232 interface
Price: £575
U.K. supplier: Hayes Microcomputer Products, The Gate Centre, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-847 4471
Available: now

SMARTCOM II
System requirement: IBM PC with at least 192K RAM
Price: £140
U.K. supplier: Hayes Microcomputer Products (address as for Smartmodem)
Available: now

There are separate screens for editing configuration settings, transmission parameters including the function-key definitions, and macros which can be entered or captured.

The package is extremely easy to use. In fact, most users should be able to get it to phone up and log on to Telecom Gold almost straight out of the box. You only have to enter the phone number on the Parameters screen and your ID under macro Z, which is loaded automatically. On-line printing — though it's a waste of the 1,200 baud speed — is selected by hitting f3. If you want to save incoming data to a disc file you press f4 instead. All data is stored automatically in a RAM buffer.

Smartcom is good value at £140. It is powerful and versatile, but is well set up with defaults and is easy to use. It could save newcomers to comms many valuable hours of learning time.

WINDOWS CONFUSING

Breakout is a fairly simple program which appears as an inverted tree of overlapping three-line windows. These are most enigmatic, to the point of being confusing. Perhaps it all becomes clear once you get used to it, but I hated it on sight.

The Breakout manual, which covers the modem as well as the software, is no better than average. The content is adequate, but in presentational clarity it compares poorly with the Smartcom documentation. However, the main function of this program is to provide viewdata communications for those

with the misfortune to have to access Prestel.

The IBM PC has considerable problems producing a viewdata image compared to micros like the BBC B or even the Sinclair Spectrum. This is not so much a criticism of IBM as of viewdata's bizarre, alphamosaic technology. For one thing, the IBM PC's comms card cannot do a split baud rate like 1,200/75. This has to be done by buffering data in software, which works but is hardly the perfect solution. Furthermore, the IBM monochrome and standard graphics adaptors have great difficulty providing a full viewdata character set, and the expensive solution is IBM's special viewdata adaptor card.

Breakout offers a choice of three compromises. With the IBM's colour-graphics adaptor, mode 1 of Breakout provides an eight-colour display and all the characters except the fractional 3/4, but it does not do double-height characters and the alphamosaics are sometimes rather approximate. Mode 2 provides an accurate display, but in only four colours on black, and with no flashing capability. Mode 3 is the same as mode 2 with different colours. If your PC is fitted with only the monochrome driver you get the monochrome version of mode 1. This is displayed on the left-hand side of the screen as the viewdata screen is only 40 characters wide — but why didn't they use the IBM's 40-character mode?

The Crosstalk XIV program from Microstuf Inc. is also supplied with the Breakout modem, and instantly makes a



BREAKOUT

Description: modem on IBM-compatible expansion card, supplied with Breakout and Crosstalk software

System requirement: IBM with at least 128K RAM; 256K recommended for Crosstalk

Price: £499 for pulse-dial version; £525 for pulse/tone-dial version

U.K. supplier: PC Communications, Business and Technology Centre, Bessemer Drive, Stevenage, Hertfordshire SG1 2DX

Telephone: (0438) 316561

Available: now

DATATALK

System requirement: IBM PC with at least 256K RAM

Price: £150, or £240 with Datacode program

Supplier: Datasoft Ltd, Ilminster, Somerset TQ19 0AN. Telephone: (04605) 4809

Available: now

good impression, especially if compared with the Breakout software. It flashes humorous quotations at you while it is booting the main code, one example being "On a clear disc you can see forever". I say "flashing" because many quotes went by before I could take them in. Obviously the program uses a delay loop suitable for a sleepy old IBM PC, whereas my Olivetti M-24 is more than twice as fast.

ON-SCREEN HELP

Crosstalk is a menu-driven program. Menus fill most of the Status screen, which is driven from a command line at the bottom. There is enough on-screen and context-sensitive help for the program to be run with little reference to the manual. That is not to say that the manual is bad: it's not, but the program itself is as easy to follow.

The area where the manual is lacking is in using some of the fancier facilities of the Breakout modem. Crosstalk looks as though it was written when 300/300 was all you needed to know about comms. It has been upgraded to handle very high speeds but, for example, you have to enter 0110 to set 110 baud, while 12 sets 1,200. The 1,200/75 facilities of the Breakout modem are not covered in the manual.

Crosstalk seems to provide much the same facilities as Smartcom II. It also has a screen-capture command called Picture. The command Picture Bert saves the screen display in a file called Bert. However, you have to turn your data-capture buffer off to

do this. Snapshot is a similar command and simply saves a screen in RAM.

Datatak is another British package, and it turns on the Apricot as well as the IBM PC. As well as standard communications facilities, it includes a full-screen text editor. When used with an IBM graphics adaptor it also chains to offer the entire viewdata set, including all graphics characters, double-height characters, flashing and reveal. However, its main distinguishing feature is an optional file-encryption program called Datacode, which can be run with it. The facility to upload and edit texts before transmitting them means Datatak will be worth the £150 initial price to many. But the £240 cost with Datacode included means you really have to need this feature to be willing to pay for it.

Datatak works in a way not dissimilar to the Breakout software, with a plethora of windows popping open all over the place. Each window includes identification, a list of options and an explanation line which changes as you move the cursor along the top line. The system is the same as that used in spreadsheets like Multiplan, Lotus 1-2-3, Logistix, etc. If you know what you want you can select an option by hitting the letter with which the option begins. If you don't you can hit f1 to get further help files.

As the manual is a fairly boring read and very dull in its presentation, the temptation is to work with the program and ignore the manual except when really stuck. Nevertheless Datatak provides full facilities for

communications and file transfer, including the XModem protocols. It has a built-in phone directory which can hold up to 128 names. As well as the usual VT-52 and VT-100 terminal emulation, it also offers the Lear Siegler ADM-3A. It has default settings which are helpful to owners of Dacom and Hayes modem.

In the end, all these packages do the job. Each has its own refinements and facilities, which may lead you to choose one rather than another. For most users, however, the major differences are in the way menus and screens are organised. This is very much a matter of personal taste, though for my money the order of preference would be

BREAKOUT/CROSTALK

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 checked="" type="checkbox"/>	<input type="checkbox"/>

A good buy if you need a built-in multi-standard modem in an IBM PC or compatible.

Smartcom II at the top, followed by Crosstalk, Datatak and Breakout in that order.

When it comes to documentation and ease of use from scratch, then Smartcom II is far superior. This does not guarantee it would remain the favourite after long-term use but it might encourage beginners.

All three packages include free membership of the U.K.'s leading electronic mail service Telecom Gold, which is growing fast and now approaching 40,000 users. That's enough to make email useful to most people in the computer industry at least.

With thousands more newcomers joining in the communications revolution, the future must lie with software that is pre-loaded with parameters and phone numbers, and manuals that don't make you feel you need an engineering degree to understand them. We need more of those.

CONCLUSIONS

■ The Breakout and Hayes Smartmodem 1200 are completely different types of modem. Both represent viable choices for people whose needs they meet, but both are relatively sophisticated and expensive. Most people could manage with less.

■ The Smartcom II, Crosstalk and Datatak programs all offer the same general level of functionality. Users who need specific facilities like viewdata emulation, text processing, data encryption or special protocols should check the specification and, if possible, try a particular package before making the final purchase.

■ Smartcom II is the easiest to use and has by far the best manual of the three packages, but does not seem to offer viewdata emulation. There is room for dispute as to whether this is a bug or a feature.

The PROS & CONS of PROLOG

As versions of this relatively new language appear for business and personal computers, **Susan Curran** explains its characteristics and possible applications.

Although developed in the early 1970s, Prolog still rates as a new computer language. It has had a great deal of attention over the past few years and there are now versions for most business-orientated personal computers and some home computers.

In the business environment, Prolog's uses might be summed up as expert systems and databases. Also it has major applications as an educational language for teaching logical thinking and problem solving; and it has an added fascination for anyone who wants to understand the thinking behind the Japanese fifth-generation developments.

TWO KINDS

It is possible to divide computer languages into two different schools: the procedural and the declarative. Declarative languages concentrate on conveying data, and procedural languages on indicating what is to be done with data. Basic is a procedural language. Most lines in a Basic program give a sequence of commands to the computer, indicating precisely the steps that the computer has to perform in order to do a particular task.

In contrast, Prolog is primarily a declarative language. To program in Prolog, you do not write a program in the sense that is familiar to Basic programmers. You provide a database of information, using the conventions of the language to indicate relationships between the data provided. You can then retrieve information from the database. The procedural aspect of Prolog

determines ways in which the computer searches the database. This includes its assignment of values to variables discovered during the search, its use of logical rules to make inferences and its ability to backtrack in order to find multiple answers.

This process is entirely alien to Basic programmers. For example, the following simple database describes some relationships in a small company:

```
boss(smith, jones).
boss(smith, wilson).
boss(evans, smith).
```

These terms all describe a relationship between two different items. The first word in each case, Boss, indicates the type of relationship; the other words name items affected by it. It is up to the programmer to define the terms used so that the relationships given are true, or at least make sense.

Some people find this way of ordering data difficult to follow and some Prolog front ends make it possible to write more natural phrases like
smith is-boss-of jones
evans is-boss-of smith

However, Prolog does not pretend to be English, and except in the artificial context of natural-language programs it does not accept normal English input.

From this simple database, it is possible to ask the system if, say, Smith is the boss of Jones. To do this, version of Prolog requires a statement like

```
?-boss(smith, jones).
```

On finding the required information in its database, it will respond Yes. The

PROLOG BOOKS

How to Solve It with Prolog by Helder Coelho, Jose Carlos Cotta and Luis Pereira. Published by Laboratorio Nacional de Engenharia Civil, Lisbon (available from Expert Systems Ltd), 215 pages. £11.50.

Implementations of Prolog edited by J A Campbell. Published by Ellis Horwood, 391 pages, £14.95. ISBN 0 85312 618 6

Microprolog: Programming in Logic by K L Clark and F G McCabe. Published by Prentice-Hall, 401 pages, £12.95. ISBN 0 13 581264 X

Programming in Micro Prolog by Hugh de Saram. Published by Ellis Horwood, 166 pages, £11.95. ISBN 0 85312 782 4

Beginning Micro Prolog by Richard Ennals. Published by Ellis Horwood, 192 pages, £6.50. ISBN 0 85312 555 4

The Purple Planet: Micro Prolog for the Spectrum 48K by Serafim Gascoigne. Published by Macmillan, 130 pages, £6.50. ISBN 0 333 38810 0

Programming in Prolog by W F Clocksin and C S Mellish. Published by Springer Verlag, 297 pages, £10. ISBN 3 540 15011 0

alternative response in this context, No, does not mean "not true". It means that it is not indicated by the database. So a query of

```
?-subordinate(jones, smith).
```

would get a No reply.

A further step is to use variables and ask, for example, which men or women report to Smith with a statement like

```
?-boss(smith,X).
```

X is the variable, and the computer replies

```
X=jones
```

If requested to continue the search it replies

```
X=wilson
```

and finally

```
no more matches
```

or some such statement.

It is quite easy to cope with simple logical relationships. For instance, it is possible to tell the interpreter that someone is the subordinate of someone else if that someone else is their boss:

```
subordinate(X,Y) :-boss(Y,X).
```

You can then ask

```
?-subordinate(wilson, smith).
```

and get the answer Yes.

Prolog goes much further than this, allowing you to combine criteria, to use simple arithmetical comparisons such as less than, more than and so on, and to introduce cuts to influence the pattern of searching. However, it is not necessary for the user to write a program to search the database. The Prolog interpreter searches it automatically, using in-built algorithms and the information provided.

Also Prolog has a list-processing facility, and it is possible to nest lists in order to express complex many-part relationships and to include longer narrative descriptions. However, it is not solely a list-orientated language like Lisp, and it allows more flexible ways of representing data.

As Prolog is so different from procedural languages a good tutorial is essential when learning to use it. Probably the first, and still arguably the best, main-line Prolog book is *Programming in Prolog*, by W F Clocksin and C S Mellish. They use a core Prolog that is basically Edinburgh standard, which should make their tutorial adaptable to any version. The book is clearly written, and I found it an ideal introduction to the language.

Most of the other books I have encountered derive from practitioners connected with Imperial College and its Prolog educational projects. They generally use Micro Prolog, and most of them make use of the Simple front end. They are not suitable as tutorials for other Prolog versions.

The Purple Planet: Micro Prolog for the Spectrum 48K by Serafim Gascoigne describes its subject area quite well. It has a clear though rather jokey approach which should be suitable for older children as well as adults.

Beginning Micro Prolog by Richard Ennals is a more serious book. It concentrates heavily on educational applications, with general material aimed at teachers rather than students. Its sample programs are tested by children and adapted to their interests, and the book is very good of its kind.

I found *Programming in Micro Prolog* by Hugh de Saram to be less successful. It launches in at great speed with little explanation of basic principles, but it does cover advanced areas, including turtle graphics on the Spectrum, and includes some useful utility modules. K L Clark and F G McCabe's *Micro Prolog: Programming in Logic* is fat, thorough and competent.

There is a great deal of serious academic discussion in *Implementations of Prolog* edited by J A Campbell, but little for the novice. Finally, the most comprehensive collection of Prolog programs I know of is to be found in *How to Solve it with Prolog*, a Portuguese publication written in English.

Since Prolog has only a very small and simple core vocabulary, it is not a difficult language to begin using. Anyone can set down a simple database in Prolog, and interrogate it in the sort of ways outlined earlier. However, full-scale Prolog programming requires considerable careful thought. It is essential to appreciate just how Prolog goes about its searching and to avoid logical pitfalls such as circular definitions. Prolog will only find the required solutions to problems if its data is structured in an appropriate way.

It is the logical thinking required for successful Prolog programming that lies behind Prolog's growing prowess as an educational language. It can be looked on as a successor to Latin in the search for effective ways of teaching children to think logically. For the business user, the care required makes database programming in Prolog a more demanding business than using a straightforward database application program.

EXPERT SYSTEMS

The language comes into its own in applications where its ability to make logical inferences is used to the full. This leads directly into the territory of expert systems, where the computer is used to take full advantage of the rules and facts fed into it. Early expert systems were largely programmed in procedural languages, but now the declarative approach is winning ground. Typical of the Prolog approach is Expert Systems Limited's ES/P Advisor, an expert-system shell program which deals with the conditional outputting of text from a database.

Among common Prolog application areas to date are planning tasks such as critical-path analysis, generalised problem solving,

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theorem proving, grammatical parsing systems, and simple translation systems and natural-language systems. It should be noted that many Prolog implementations have only very crude arithmetical facilities, and that it is primarily a language for manipulating symbols and text rather than numbers.

So how useful is Prolog in a business context? Prolog is a language directly useful only to those who are prepared to indulge in computer programming. Business end-users who see no point in writing even two-line Basic programs are not going to become overnight converts to Prolog. However, systems developers who work in fields involving the intelligent handling of volumes of data should find Prolog an extremely useful tool.

Prolog's newness is evident in the roughness of its user interface. Decent program editors are regarded in some implementations as an unnecessary luxury. The version I have been using lacks any in-built Load and Save command, making the business of drawing up and then saving a database much less transparent than it might be to naive users. If the language gains ground fast among the semi-expert, then these deficiencies are likely to be remedied. Micro Prolog, the version

available for the Spectrum and other popular home/educational micros, goes much further in this direction than do the Prologs derived from mini and mainframe environments.

Increasing numbers of application programs are being written in Prolog. Many of those who use such programs may find it helpful to understand the underlying logic of declarative languages, and to appreciate their fundamental difference from procedural languages. In well-written application programs it is possible to provide a user interface that is up to the sort of standard familiar to users of commercial databases.


It is exasperating to find that a relatively new language like Prolog should spawn dozens of variations, with little agreement on even the most common points of grammar. However, two Prolog standards seem to be emerging. The first is derived largely from early mini/mainframe Prolog implementations. It goes under various names, the most common of which is the Edinburgh standard.

DIFFICULT TO USE

ESL produces expert systems written in Prolog and several versions of Prolog itself, mainly for business-orientated personal computers. It also has a version for the Sinclair QL in the pipeline. Prologs of this school should be thorough and bug-free, and better ones have extensive formal capability, but they can be poor in user-friendliness. ESL's manual is not orientated to novices and the Prolog 1 package includes a non-integral clause editor rather than a full program editor.

The current alternative, Logic Programming Associates' Micro Prolog, seems to be more user friendly. Micro Prolog runs on Z-80 machines and on the Sinclair Spectrum in particular, making a cheap introduction to Prolog — though a Spectrum system is clearly not suitable for intensive business use. One of its features is a front-end program called Simple, which makes writing programs easy. Simple is widely employed in elementary books on Prolog, and this can make such books difficult to follow for users of versions of the language that do not have a similar front end. Even more confusing, some Edinburgh-type Prologs now imitate Simple, and Micro Prolog offers an imitation of Edinburgh standard syntax.

Features that differentiate Prolog versions include: the facility to use floating-point and negative numbers, rather than positive integers only; provision for types of variable names; the amount of workspace available, depending upon the processor; the provision of modules to simplify programming; and the general syntax. Some versions are excessively fond of nested brackets, in Lisp style; others employ a more natural-language approach.

The prices of Prologs vary widely. Grey Matter deals with a large range, and its prices range from around £75 for eight-bit Micro Prolog up to £2,000 or more for professional-standard compilers. 



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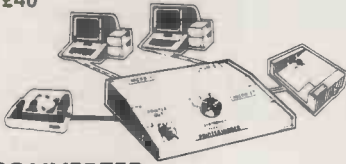
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INTERVIEW

BEN ROSEN

INTERVIEWED BY GLYN MOODY



Ben Rosen worked as an electronics securities analyst from 1965 to 1979, during which time he gained insights into the burgeoning electronics and micro industries. From 1979, while publishing a newsletter, he began making investments in the firms and products he recommended, one of which was VisiCalc. He went on to join L J Sevin, co-founder of the Mostek semiconductor firm, and they entered the field of venture funding full-time. Undeterred by an early failure with Osborne Computers, Sevin Rosen went on to back sensational winners like Lotus and Compaq computers. Its latest venture is the Paradox database from Ansa Software, which we review on page 66 of this issue.

Why do you think you are so successful in your venture-capital projects?

WE HAVE HAD some major successes both in the personal-computing field and also outside it. We've also had our failures; we talk less about our failures than our successes. We think it's important to fail because if you don't have failures it means you're not being aggressive enough in your investment — taking big chances. The chances we take are things like investing in companies right at the start when it's a sheet of paper or two lines of code. One of the things we do as a venture-capital company is we work very closely with our companies and we give them as much support as they want in a variety of areas. Usually when the company starts it's one or two people who have never run a company before.

How does the process begin; do they come to you or do you go to them?

IT WORKS both ways. For example, I had known Mitch Kapor for four years, so when he was ready to start Lotus it was natural that we got together. In other cases, such as Compaq and Ansa Software, there were people that we knew well who knew the founders well.

What sort of criteria do you use for selecting projects?

WE INVEST primarily in people because it is the people who make things happen. If the people pass muster, we try to make sure that they are satisfying an unfilled market need. And if the market need is there, the last thing we do is look at the product to see if it is of a quality that will meet that need.

Now that you've got things like Compaq and 1-2-3 are you consciously building a balanced portfolio?

THE ONE area we really looked at consciously and said we want to invest in this area is the database software area because we thought there was a need. We looked at about 100 possible database solutions until we came across Paradox. But generally we don't target a specific area, we look for entrepreneurs who we think can build major companies.

You mentioned that you like to be fairly closely involved with the companies; do you actually help specify and respecify a product during its development?

WE GET involved more in an advisory role, especially during the early days of the company. I'd say that we can help the company a lot by telling them what's

happening in the world, what would be desirable and not desirable, but the main features of the products tend to come from the entrepreneurs themselves. If they didn't we would have the wrong entrepreneurs.

So after the launch you become more involved in the management processes?

NORMALLY we put one or more of our partners on the board, often as non-executive chairman, as I am with Ansa and Compaq. It's a role which is more active than a director but less active than a manager.


Given that you do have this involvement, what went wrong with Osborne?

OSBORNE was a wonderful example of what not to do. It was the second investment we made when we started in 1981. We went in on the second round where we were just invited in as a passive investor. We had neither control nor representation, barely participation. And it's the kind of thing which we said we would never do again.

What do you think the key areas in microcomputing will be in the next few years?

I THINK the main trend in the next couple of years will be software which fully takes advantage of the hardware technology. In 1986 and 1987 you're going to see a proliferation of products with the 286 and 386 microprocessors. There is very little software which takes advantage of the speed, the memory addressability, of the storage capabilities and multi-user capabilities, of these processors. So I think that you're going to see a swing from the 8088 to these much more colourful computers. And they are going to do two things. First allow lay users to hit software that lets them use a computer where they couldn't before; and it's also going to allow the power user to do much, much more than he ever could before.

How do you expect the market to work out this year and next year?

WELL 1985, it turns out, was not a very good year for the mainframe industry, not a very good year for the minicomputer industry, not a good year for the home-computer industry, but it was a terrific year for business personal computers. The business personal-computer market was good, is good, and is going to be stimulated by the new hardware and software coming out. We think that the business personal-computer market 1985 grew in the 30 to 40 percent area and we think this year it's going to be in the 20 to 30 percent area. A lower rate of growth, but still a real growth, substantial growth, and we're quite optimistic about it. 

The computer industry is paved with gold for the fortunate few who can come up with bright, new, commercially successful ideas — or such is the theory. In practice, it may be someone else who is laughing all the way to the bank: someone who has taken advantage of the bright idea and marketed a cut-price competitive clone.

The legal rights and wrongs of this situation are complex and in need of reform. The law gives no protection to an idea in itself. Instead, it protects the fixed form in which the idea is expressed, which it recognises as the intellectual property of the originator. Within the generic term "intellectual property" are included the concepts of patent, copyright and trade marks.

After years of uncertainty, Parliament has recently confirmed that computer software is protected by the law of copyright, although in a manner which begs more legal questions than it answers. The Copyright (Computer Software) Amendment Act 1985 provides that the Copyright Act 1956 applies to a computer program "as it applies in relation to a literary work . . . whether or not copyright would subsist in that program apart from this Act."

AUTOMATIC INFRINGEMENT

There are two consequences of this. First, source and object code are protected as "literary works". Any reproduction without authority from the copyright owner will constitute an infringement. Secondly, the Act does not prevent authors of computer programs from claiming that copyright protection attaches to their work for some reason other than its analogy to a literary work.

Counterfeiters and others who take duplicates of an original program are clearly guilty of reproduction. The more difficult cases are those in which a program is reworked by a competitor who then sells a version of the program as his or her own original work. Here the issue determining copyright infringement is whether a substantial part of the original work survives in that of the competitor. The competitor may lawfully use the original work as a source of ideas or information, provided that he or she takes it as a starting point for exercising his or her own labour, skill or judgement. You cannot simply use the originator's skill by, for example, revising a collection of original and detailed information in different words.

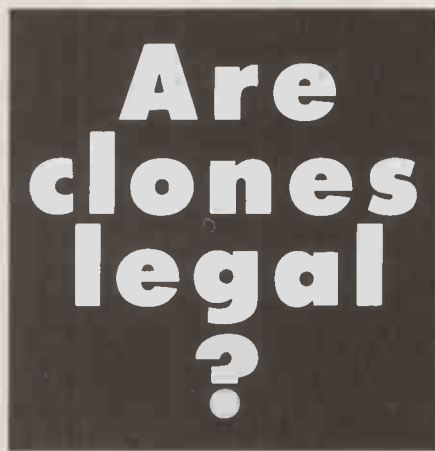
The computer software industry is particularly vulnerable to plagiarism of this nature, since it is invariably possible to rework the source code sufficiently to avoid reproducing that literary work, while retaining the functions of the program.

In addition to literary works, artistic, musical and dramatic works are protected by copyright as well as films, sound recordings and broadcasts. Whereas much of the visual imagery appearing on a television screen is protected by film copyright, this is not applicable to images on the VDU of a computer. However, many programs have a

lot in common with artistic works, since they trade in visual imagery and the aesthetic appeal of graphics or layout sells copies. So does this give more scope to those companies complaining of clones?

In judging whether an artistic work has been plagiarised, a court will test similarity by appeal to the eye, and by the feeling and artistic character of the work. Computer games would seem to fall within this category, but although producers of programs for business and other functional use may display a distinct style of layout, they may find it more difficult to have their work defined as "artistic".

Regardless of artistic quality, paintings, sculptures, drawings, engravings and photographs are artistic works. So too are works of architecture.



While outright copying is now clearly banned, the position of look-alike programs remains unresolved, as Anne Staines explains.

A final category encompassing "works of artistic craftsmanship" is the most promising goal for the functional computer program. Inevitably it is the most controversial, since the leading case — a House of Lords decision — left doubts as to whether it is the public's view of a work as aesthetic rather than utilitarian which makes it artistic or the creator's intention to create a work of art. In any event, it must have aesthetic visual qualities. Jewellery, furniture and toys are examples of items currently falling within this category.

Litigation in this field was universally avoided before the law was amended, in view of the absence of authority that computer programs were copyright works. Even without this hurdle, plagiarism remains one of the most complex and difficult law suits. But Systems Union Ltd, a British software house, has now commenced an action against Simdell Ltd over alleged plagiarism of Systems Union's Sun Account business software.

System Union is encouraged by the

judgment of an American District Court last year. It ruled that copyright in a program initially designed for the IBM Series I computer and written in EDL was infringed by a competitor who produced a functionally identical program for the IBM PC in Basic. The source code was not literally translated into Basic and bore no direct or apparently derivative visual resemblance to the original in EDL. This decision is remarkable for two reasons. First, it defines as copyright-protected what the source code does, rather than what the source code looks like. Secondly, it decides what the source code does by reference to what the screens look like.

This decision illustrates some of the characteristics of a rather different form of legal protection which could provide a partial answer to the general debate on the legality of cloning. The U.S. and a number of European countries have a law of unfair competition. In West Germany this law was successfully invoked to protect computer programs against imitators before the copyright law applied to such works there. A person is said to be guilty of unfair competition if in the course of business activity for the purposes of competition he or she acts contrary to honest practices. The unfairness lies in the direct appropriation of the fruits of the originator's money, effort and labour without any corresponding investment by the copier.

SLAVISH IMITATION

Slavish imitation is a common form of unfair competition. Here the judge considers whether non-experts would recognise points of resemblance between an original work and an imitation when making a visual comparison. The U.K. recognises no such law, although there is strong feeling among some lawyers that it should. A law of unfair competition might provide a more appropriate framework for reconciling interests in new types of property than copyright, within whose structure it is increasingly apparent that computer software is neither one thing nor the other.

However, unfair competition as it operates in Europe does not always protect originators, since a claim can be defeated on the ground of public interest. Many would argue that legally protected monopolies in the computer industry would be decidedly against the public interest. So it is only a partial solution.

A White Paper on copyright law reform is expected imminently. It is believed that the Government has been toying with the idea of compulsory licensing of some types of invention, in some cases. This scheme, whereby an inventor must sell a licence to someone wishing to manufacture their invention, is popular in Japan although the idea is generally disliked in the U.K. A combination of unfair competition with compulsory licensing is a suggestion worth considering. It could be a means of ensuring that benefits accrue all along the line, to inventors, innovators, authors and consumers alike.





STEPHEN WRIGHT

Many small companies now choose to lease their computer hardware. **David Kelly** explains how changes in tax regulations may be making other options equally attractive.

THE PRICE OF FLEXIBILITY

Over half of the computer equipment in use in British business is either leased or rented. Companies lease or rent rather than buy because it is convenient, cash efficient or tax beneficial. As a result, over the last five years, computer leasing and rental has become big business. It provides a significant sector of operations for financing giants like Lombard and has turned smaller specialist computer-leasing companies into firms with turnovers of over £25 million.

At present most companies leasing or renting do so for one simple reason: the initial cash outlay is a fraction of the full price of the equipment, typically three percent of the purchase price per month. Any company looking at leasing or rental is faced with a

bewildering choice of contracts and methods of financing, and it pays to research thoroughly since the rates and fringe benefits can vary enormously.

From 1 April this year capital allowances are being abolished, and this is certain to change the face of computer purchasing and leasing habits. Alternatives including hire-purchase and traditional bank finance could become more attractive, and leasing companies are beginning to adapt to the challenge already.

In the recent past, leasing has proved to

be far more popular than rental. The lease is taken out between the customer and the leasing company, with a computer dealer acting as an intermediary. When the leasing deal is concluded, the dealer sells the equipment to the leasing company, which retains ownership of the equipment even after the lease period has expired.

Usually the length of the lease period is three or five years. Most finance houses treat a computer lease as any other equipment lease, and the make or model is usually unimportant. For the finance house it is purely a financial transaction, although some set a minimum value for the lease of around £1,000. Costs vary considerably, but on average work out at around £25 a month per £1,000 worth of equipment.



MIKE CORNALL

RENTING

Computer renting has been growing steadily over the past five years, and the changes to capital allowances mean it is likely that leasing will decline even further in popularity. Renting is usually undertaken over shorter time spans than leases, typically less than two years. Premiums are higher than for leases, and there is a much closer relationship between the rental firm and the customer. For example, rental usually includes a servicing agreement. Computers are reclaimed at the end of the rental agreement and either rehire or sold. As a result the rental firm does not necessarily need to recover the total cost of the hardware within the rental period. For the customer there are a number of advantages. As well as the servicing arrangement, a rental agreement is likely to be more flexible than a lease. At any time the customer can terminate the rental agreement, change micro systems altogether or upgrade.

Typical rental costs are around £80 per month per £1,000 value of the machine over a relatively short period of several months. As the period of the rental contract is extended, so the rental costs come down. For example, one of the larger computer rental firms, Hamilton Rentals, drops charges for a rental of one to two years to between £40 and £50 per month per £1,000. The price includes full service contracts.

Unlike the leasing companies, which will usually provide finance for any hardware the customer wants, rental firms tend only to rent equipment for which there is a ready market. After the initial rental period is over they will want to rehire or sell the equipment. A lot of rental business comes from large companies which may have a temporary shortfall in computing power. For example, demand is high between January and April, when companies are preparing their year-end accounts.

Charges are highest for short-term rentals. Micro Rent, a company specialising in the lower-end business PCs, charges £38 a day for an IBM PC — worth roughly £1,200 — £75 a week, £225 a month, £153 a month for six months, £122 a month for a year, and £105 a month for two years. Customers who wish to terminate a rental agreement before the end can simply pay the difference between the charge rates for the longer and the shorter periods.

It is not just the higher-priced models which can be rented. Sagesoft hires out Amstrad 8256 machines for two- three- or four-year periods for between £13.50 and £9.50 a week. Computer Hire Services will hire anything from an Amstrad 8256 or BBC model B to Commodore 64 at prices ranging between £5.40 and £17 a week.

Most of the giant finance houses like Lombard and Lloyds Bowmaker are involved with computer leasing. In Lombard's case, computer leasing forms a very substantial portion of its leasing portfolio. "The beauty of leasing", says Lombard's Eric Daniel, "is you can project the cost of a piece of equipment over a period of time." Dealers benefit, because once they sell the equipment to the customer, they are then only responsible for the merchantable quality of the goods.

FINANCIAL ARRANGEMENT

The lease company involves itself only in a financial arrangement with the customer, and usually there is no service agreement built into the lease in case of computer fault. If anything goes wrong with the equipment you go back to the dealer and the problem is dealt with as if you had purchased the kit yourself.

If, on the other hand, you choose to rent equipment you may pay more than you would if you chose to lease, but most companies will offer to replace your equipment immediately should there be a fault. This is because companies view the equipment they rent as equipment they will rehire once a particular rental period is over. Leasing companies are mainly concerned with recovering the cost of the equipment over the period of the lease, and are unlikely to have any interest in the equipment after termination of the lease period. This in turn has the advantage that the leasing company may sell you the equipment for a nominal sum or let you have it for free at the end of the leasing period.

The majority of leases are for three or five years, unlike renting which is normally for a period of weeks, months or a year. Generally customers can choose to extend the lease on an annual basis after that time, but most prefer to re-equip.

The main drawback with leasing is its inflexibility. Once you have leased a

computer for a three- or five-year period you are stuck with it for that time, with varying penalties for early termination of the lease. But companies' data-processing requirements change quickly, and technology is still advancing rapidly, so a three-year commitment can seem like a long time.

Smaller brokerage firms specialise in computer leasing tend to offer marginally more expensive rates than larger leasing firms. But because they do not rely on such large volumes of business, they often provide a more flexible leasing arrangement. For example, Armour Leasing and Finance offers a number of facilities in its Systems Lease scheme which allow the customer to upgrade a computer system in the course of the period of the lease. You can add new terminals, disc drives and printers, for example, under a subsidiary leasing agreement which finishes at the same time as the original lease. Armour Leasing's current rates for equipment worth over £2,000 — it would not deal with anything much smaller — are around £36 a month per £1,000 over three years, and around £25 a month per £1,000 over five years.


CHEAPER RATES

Under the old tax rules companies were able to claim up to 100 percent capital allowance on hardware, which they could set off against tax. This made leasing attractive to many small companies whose tax liability was less than the capital allowance they could claim on their equipment. By leasing the equipment from companies which could make use of the allowance, they were able to reap some of the benefits in the form of cheaper lease rates.

Under the new rules the capital allowance is to be replaced by a 25 percent writing-down allowance. Leasing rates are likely to rise by around seven percent, making leasing a less attractive option. It is not yet clear how this will affect leasing patterns. The effective reduction of the tax advantage means that it

would seem attractive to buy rather than lease, especially as more companies are now paying tax. However, some companies may well decide to put their money where it will contribute directly to turnover, such as in advertising or stock, and to spread their payments on equipment over a period of time.

A company's tax position is crucial when deciding whether to lease, rent or buy. It must work out the after-tax costs of borrowing money through conventional means and compare it with the after-tax costs of leasing. Whether one or the other is more favourable will depend on an individual company's ability to take advantage of the tax allowances.

The tax-paying company may well find it better to use other forms of medium-term financing, such as hire-purchase or bank finance, which is likely to become comparable with the cost of leasing. It is also likely that the boundary between rental and leasing will become more uncertain as leasing firms offer shorter terms, possibly with options built-in for upgrading systems during the course of a lease. 

SUPPLIERS

Hamilton Rentals (U.K.) Ltd
Hamilton House, North Circular Road,
London NW10 7UB. Telephone: 01-961
6777.

Micro Rent 127 Clouesley Road,
London N1 0EN. Telephone: 01-833
2531.

Computer Hire Services 294a
Caledonian Road, London N1 1BA.
Telephone: 01-607 0157.

Business Equipment Leasing PO
Box 138, 286 Southbury Road, Enfield,
Middlesex EN1 1UQ. Telephone: 01-804
2411.

Armour Leasing and Finance Ltd
Townsend House, London Road,
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TOP 10

Spreadsheets, word processors, databases and utilities: the number and kind of packages available to the business user is on the increase. **David Barlow** introduces our selection of the 10 packages to look at first.

The business user is now spoilt for choice when it comes to selecting software — a very different situation to that prevailing a year or two ago. But the criteria on which to judge what packages are essential proves particularly tricky.

For example, WordStar is still probably used by more people worldwide than any other package but it is now selling in relatively small quantities. Even its successor, WordStar 2000, has failed to make a serious dent in the sales of the current WP favourites. Software from each of the major categories also has to be included.

We decided to split the Top 10 packages into four groups: spreadsheets, word processing, databases and integrated software, and utilities. We have obviously had to leave out many worthy packages, but our Top 10 should at least provide a yardstick against which other software may be judged.

Lotus 1-2-3 continued to consolidate its position in 1985 and has only recently begun to look under threat. Microsoft's Excel, now available for the Macintosh, will become a serious challenger when the IBM version is released. The more immediate threat is from two cheap clones, VP Planner from Paperback Software and Twin from Mosaic. Both packages outperform Lotus 1-2-3 and cost a fraction of the price. Whether they can make any great inroads into Lotus 1-2-3's massive user group, especially at corporate level, is another matter.

It is rather sad to have to report that the end of 1985 saw the demise of the innovative, all-British financial-planning package FT Moneywise. The major feature of this product is the way it splits huge spreadsheets into a book of manageable pages.

The word-processing front has been relatively quiet. Micropro launched Easy, a cheap, simple-to-use companion to WordStar, to a very mixed reception.

WordStar continues to sell in surprising numbers; Micropro's much publicised amnesty, allowing users of pirated copies to come clean, put this ageing superstar back on the front pages of the computer press, if nothing else.

Also at this end of the market is Bonnie Blue. It has a few rough edges, but at £99.95 it is exceptional value for money, though a spelling checker and a decent manual may be sorely missed by some.

The first shortcoming afflicts quite a few otherwise worthy WP packages, but Turbo Lightning from Borland International could well provide the answer. It is a versatile high-speed spelling checker which can be used in collaboration with most WP packages. Many integrated spelling checkers are either too slow or too cumbersome to be taken seriously.

Integrated software continues to be a slow seller, and the end of 1985 saw some interesting marketing manoeuvres in an attempt to boost sales. Following a trend set by Smart of selling modules separately, SPI announced that it too would be selling its product, Open Access, in independent chunks. The main advantage is that users can purchase the modules in stages, which is less painful on the pocket and less daunting on the brain when it comes to finding your way round the package.

Lotus's Symphony has been revamped and provided with a more readable manual but still has not won friends in the same way that 1-2-3 did.

dBase III continues to maintain its position as the most popular database, despite competition from significantly more powerful packages. So far its established reputation has been enough to fend off all comers, but Paradox, from Ansa Software, looks like being a serious threat before the year is out. Like dBase II it boasts a full-blown programming language, but it is designed to be far easier to use. Paradox is reviewed by Mike Lewis on page 66 of this issue.

The Top 10 does not include any user-friendly operating-system extensions as they are still in their infancy. Digital Research's Gem is excellent value and very easy to use, but you need a hard disc to get the most out of it. The most promising Wimps-based front end is Microsoft Windows, which offers true multi-tasking. The drawback is that it requires sophisticated hardware to maintain acceptable response times — even more so than Gem. IBM's own offering Topview, though potentially the most important, seems to have disappeared without trace.

PC

SUPPLIERS

dBase III, Framework, Multimate

Ashton-Tate (U.K.), Oaklands, 1 Bath Road, Maidenhead, Berkshire SL6 1UH. Telephone: (0628) 33123. Circle no. 361

Excel, Word Microsoft, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741. Circle no. 362

Lotus 1-2-3 Lotus Development (U.K.), Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281. Circle no. 363

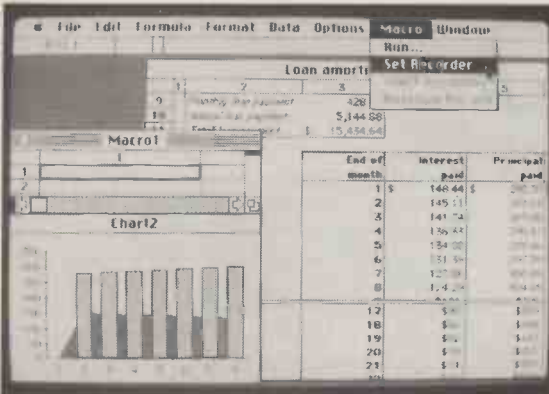
Reflex, Sidekick Altor, 11a Blythswood Court, Anderston Centre, Glasgow G2 7PH. Telephone: 041-226 4211. Circle no. 364

Vicom P&P, telephone (0706) 217744; Softsel, telephone 01-568 8866; First Software, telephone (0256) 463344. Circle no. 365

Word Perfect Sentinel Software, Wellington House, New Zealand Avenue, Walton-on-Thames, Surrey. Telephone: (0932) 231164. Circle no. 366



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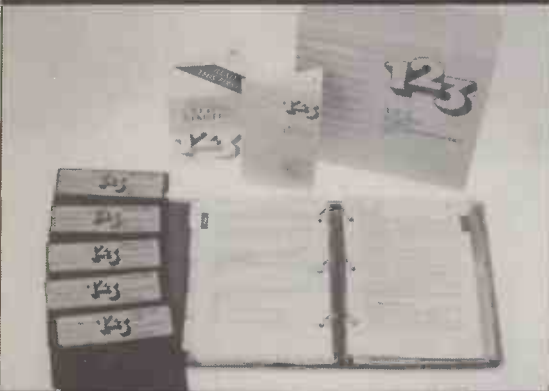
EXCEL

£395

Currently only available for the Macintosh, but Microsoft has made no secret of the fact that an IBM version will be launched this year. Intended to be Microsoft's answer to Lotus 1-2-3, Excel is a more modern super-spreadsheet package with extensive graphics capabilities. It uses the Macintosh's pull-down menus to good effect and so is easier to use, and it has an especially powerful macro facility. The command structure is similar to that of existing Microsoft packages Multiplan and Chart. Users of these packages can upgrade to Excel at an advantageous price. Switcher, a pseudo-multi-tasking utility that allow users to switch between major applications, is included in the price of Excel.

FOR Fast. Powerful. Easy-to-use Mac interface.

AGAINST Macintosh version only at present.



LOTUS 1-2-3

£395

Although originally promoted as an integrated package it is really just a spreadsheet with a graphics module tacked on. A simple spreadsheet-format database is thrown in for good measure. Word-processing facilities are not provided; if you want these you have to go to 1-2-3's sibling Symphony. Lotus 1-2-3 has now become the de facto standard for PC-based financial planning, even in large corporations. Its popularity has encouraged other software houses to launch add-ons, including standard application templates, report generators and a short-cut model generator from Fox & Geller. Lotus 1-2-3 Release 2 clears up some of the original package's shortcomings and permits the use of memory above the 640K limit to build bigger models.

FOR Powerful. Excellent graphics and macros. Wide variety of spin-offs.

AGAINST Expensive. Getting old.



WORD

£400

An unusual word-processing package which really needs a mouse device to work effectively. It works in the IBM's graphics mode rather than text mode, so different type styles can be displayed on-screen and output to a suitable dot-matrix or laser printer. It is a WYSIWYG package. Its user interface is similar to other products in the Microsoft family such as Multiplan. Word version 2 includes an integral 80,000-word anglicised spelling checker, a larger editing screen and an automatic hyphenation facility. There is also a version intended for use on networks which includes advanced print spooling and file sharing.

FOR Displays multiple text fonts. Spelling checker.

AGAINST Expensive. Hard to learn.



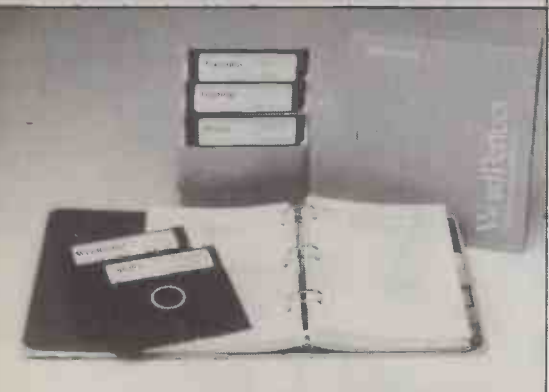
MULTIMATE

£450

Recently acquired by Ashton-Tate, Multimate is one of the most robust professional WP packages on the market. This is partly because it was initially based on Wang dedicated WP software. Although more at home in the typing pool than in creative hands, Multimate is very resistant to mistakes. Documents are automatically saved to disc page by page, very little being held in memory at any time. This is a good idea from the point of view of data integrity but it makes moving around a large document painfully slow. Multimate is not a WYSIWYG package, but it is especially good for boilerplating and mail-merge applications. The newly announced Multimate Advantage is a more powerful version which can also be used on PC networks.

FOR Robust. Built-in spelling checker.

AGAINST Cumbersome pagination. Expensive.



WORD PERFECT

£425

When judged against other WP software Word Perfect wins hands down. It is a WYSIWYG package suitable for all kinds of writers, and being a memory-based package limits the size of document to the amount of RAM available. This has the advantage that it is not necessary to wait at the end of a page while the typed page is stored. Word Perfect includes many advanced facilities like macros, auto hyphenation, footnotes, and an extensive mail-merge facility. The latest version also includes a thesaurus function and multi-column text handling.

FOR Full feature list. Thesaurus. Spelling checker.

AGAINST Expensive.



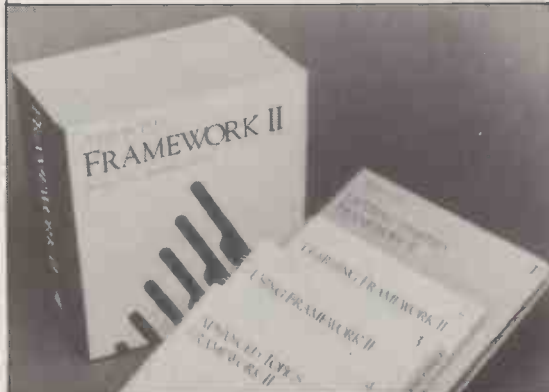
REFLEX

£99

Until Borland International bought out Analytica Software this package retailed in the U.K. for £460. At its new price of £99 it is a real bargain. Although loosely described as a database it is not really ideal for storing textual data like names and addresses. Its forte is analysing numerical data, and in this area it has few peers. Reflex allows data to be viewed in four ways: as a user-designed entry form, a list of all records, a cross-tab view combining selected fields from a set of records, or as a graph. The universal use of the IBM graphics mode enables a graph and a related data form to be displayed simultaneously. However, it is only possible to have one file open at any time and Reflex lacks even the most rudimentary form of security.

FOR Innovative. Easy to use. Built-in graphics. Good value.

AGAINST No macros. No programming languages. No security.



FRAMEWORK

£550

An integrated package launched about the same time as Lotus's Symphony to critical acclaim. Framework offers a spreadsheet, database, word processing and comms facilities all within a common shell. Once the basic concepts have been grasped it is easy to use and offers excellent integration between modules. The outlining facility provides users with the means to organise ideas and concepts into a logical format and then expand them with words, graphs, database and spreadsheet information. A comprehensive programming language is included which allows users to develop customised applications. Framework II has a larger spreadsheet, thanks to the use of virtual memory, and the word processor is improved by the addition of a spelling checker.

FOR Powerful. Version II has worthwhile WP. Outlining.

AGAINST Complex. Demands expensive hardware.



dBASE III

£550

dBase III is a total rewrite of dBase II designed to make the most of IBM's 16-bit processor. It is now a much more powerful database able to handle a notional one billion records and manage 15 open files. Ease of use has also received attention, and dBase III includes several features which help first-time users to create a simple database. The powerful programming language makes it ideal for generating turnkey customised software for specific applications. dBase III+ is the new version suitable for use on PC networks.

FOR Industry standard. Powerful programming language.

AGAINST Use of unfriendly "." prompt. Expensive.



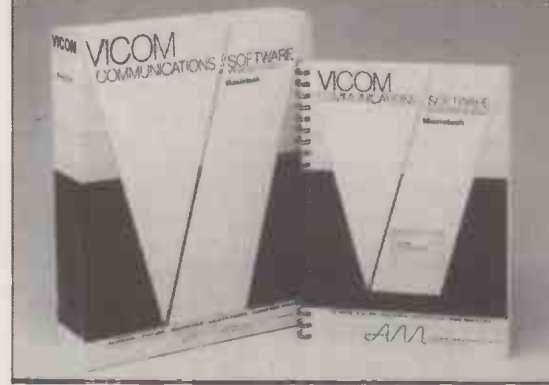
SIDEKICK

£47

The first desk-top aid package has become something of a standard even if it is no longer the best. Sidekick is loaded into memory prior to the applications software, and its main menu can be called at any time by pressing the IBM's Ctrl and Alt keys together. Its facilities include a notepad with a WordStar-compatible text editor, a calculator, a calendar with appointments scheduler, and an autodialler. It is useful and good fun, with an almost infinite combination of garish colours available on suitable monitors. As it resides in memory between the operating system and software there are rare occasions when mismatches may occur, leading to the application crashing. Sidekick also tends to reveal compatibility shortcomings of computers which claim IBM compatibility.

FOR Useful. Easy to use.

AGAINST Can crash when used with certain hardware/software combinations.



VICOM

£150

Communications is a notoriously difficult area for the newcomer but Vicom's unusual pictorial approach is helpful for both beginners and experts. It has been on the market for some time in Apple II and Macintosh versions and an IBM implementation has just been announced. It supports viewdata services as well as ASCII text services like Telecom Gold. Colour is used to good effect on the Apple II, and is substituted by shades of grey on the Mac. It works with a 128K or 512K Mac and a wide variety of modems. Latest version includes VT-100 and VT-52 terminal emulation and printer spooling.

FOR Easy to use. Capable. Good use of Macintosh graphics.

AGAINST IBM version just released and requires Gem.

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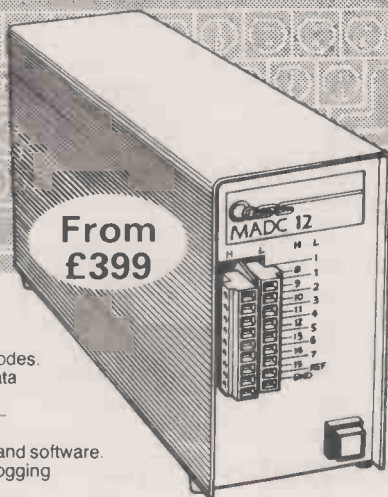
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There has been a shift in the hardware world recently. As the main system boxes become even more similar, more interest has been devoted to peripherals associated with getting data in and out of those vanilla machines. The increasing availability of these devices is also a function of computing power. Where in the past the main processor struggled to cope with just the software tasks imposed on it, today's powerful chips have the spare number-crunching capacity to deal with subsidiary calculations associated with input and output peripherals.

In some respects input devices have not yet fulfilled their promise. When *Practical Computing* last looked at this area in September 1984, two of the most promising technologies were voice input and touch-screens.

Nothing indicates the fall from grace of speech input more clearly than the saga of the Apricot Portable. When it was introduced for £1,695 it seemed a bold attempt to leapfrog previous price-performance. Until then you paid £1,250 for Texas Instruments' Speech Command System, plus another £2,295 for the micro to run it on. But there were problems. Apart from visibility difficulties with the Apricot Portable's LCD, the voice-input system was not reliable enough for serious everyday use. After a series of price cuts, the Portable now languishes in Dixon's as an end-of-line sale, and can be had for a mere £495.

The problems with the Apricot Portable highlighted the main difficulty with speech-input systems so far: they need considerable computing power to work efficiently. At present such power lies beyond the reach of the desk-top micro.

What is really wanted is a system which has a vocabulary of at least 5,000 words, can cope with a wide variety of accents, and is not sensitive to background noise. Ultimately such systems will be used in conjunction with artificial intelligence to provide the ultimate input system and micro interface — but not yet. However, many computer manufacturers, software houses and telecomms authorities are working on such systems.

OUT OF TOUCH?

The other class of input devices which was around 18 months ago was the touch-screen, most notably on Hewlett-Packard's 150 series of micros. In principle this seemed attractive: to select items you simply pointed at areas on the screen, and infrared beams detected the relevant spot and acted accordingly. But the system failed to sell and Hewlett-Packard has unbundled the touch-screen from the micro, though it remains available as an option. Other touch-screen products have also failed to find favour.

The field of visual inputs has taken off in recent months, until it has become perhaps the most exciting area of input technology. Visual input is very memory hungry. Typically, you will require a good few tens of kilobytes of RAM to store high-resolution

Give and Take

The technology for getting data in and out of micros is developing rapidly. **Glyn Moody** discusses some of the options available.

images; some may even require megabytes. That scale of RAM is now available relatively cheaply. A few years ago 64K would have cost a king's ransom, and seemed beyond the wildest dreams of programmers. Today you can find a number of low-cost machines offering a megabyte of RAM as standard for a little more than an IBM PC.

PROCESSING POWER

Also, processors now have the raw power to handle bit-by-bit manipulation of these images stored in RAM. In the past, processing video input would have been a slow process, and not one conducive to easy and creative use. Today on machines like the Commodore Amiga you can move entire screens with 32 colours as easily and as smoothly as if they were simple cursors. The review of Amiga software on page 68 of this issue gives some idea of the graphics resources of these machines.

It is also worth noting that a frame grabber is under development for the Amiga which will allow direct visual manipulation of video images input from a camera. Simon Beesley's article on page 94 examines some of the techniques available.

Another crucial reason for the sudden flowering of visual-input devices is the appearance of output devices like laser printers which are now relatively cheap. They allow the manipulated video data to be printed to a high resolution, without recourse to expensive dedicated machinery. It is now straightforward to merge visual images with text documents, make up whole pages on-screen, and then print them on a laser printer to produce presentation-quality newsletters, documents, etc.

This shift of emphasis towards visual input mirrors the increasing use of graphics within software. On the one hand, you have Lotus 1-2-3 and its rivals, most of which boast extensive graphics capabilities. On the other you have the Macintosh interface, now joined by Windows, Gem and the Amiga. All of these developments have served to inculcate a visual approach to computing. It is only natural that the next step should be the direct inputting and manipulation of other types of visual information. In this respect the advent of low-cost devices like Thunderscan reviewed on page 96, together with the new class of intelligent photocopiers is significant.

The increasing use of icon-based programs has also led to a significant rise in one of the humblest yet most useful input devices, the mouse. This hand-held pointer

is now to be found not only on the Mac, Atari 520ST and the Amiga, but also on a growing number of MS-DOS machines and programs. To this extent, the traditional input device of the keyboard is being superseded.

On the output front, things are more limited. Once you have some data which you want to pass to the outside world, you can either print it to screen or printer, or push it on to other machines. For this, you could use a local area network or a modem.

As our December 1985 issue reported, the whole field of communications has taken off enormously. The desire to join up with the outside world almost invariably means getting a modem, sales of which are beginning to rocket. Following this surge of interest, prices are tumbling. Many modems now have autodial and auto-answer features. The latest developments involve faster speeds. Although many people are still using 300 baud modems, there is a shift towards 1,200 and even 2,400 baud models. Inevitably, this process has gone much further in the U.S. Steve Gold looks at the developments in this field on page 98, together with a full listing on pages 100 and 101 of those modems which have BT approval.

The area of inputs and outputs is in a state of flux. We are already seeing the rise of visual-input devices. On the horizon are voice-input devices which are likely to alter radically the way we use computers. Then there is the huge growth in the use of modems, which has changed the role of the micro in the office. Many of the major developments in micros are now occurring outside the confines of the main processor unit. Inputs and outputs are certainly going places.

IN THIS SPECIAL SECTION:



Opposite: New input devices.
Page 94: Video and computing technologies are converging.

Simon Beesley reports.

Page 96: Joanne Bennett looks at a low-cost way of getting images off paper and into a Macintosh.

Page 98: Steve Gold checks out what matters in a modem.

Page 100: Monster modem list.

MALTRON ERGONOMIC KEYBOARD

□ One of the most radical of the alternatives to the conventional QWERTY keyboard is the Maltron keyboard. The keys are divided into two sculpted groups for the fingers, and two separate groups for the thumbs. The most frequently occurring letters are placed under the normal finger and thumb resting positions.

According to its proponents, the advantages of the Maltron are many. It is claimed that strain on the user is diminished as the wrists are held straighter, typing speeds increase and that the layout is easier to learn.

Maltron keyboards are available for most of the popular computers, including the Apple II, BBC and IBM PC. Prices are £295 for the Apple and IBM versions, £175 for the BBC. More details from PCD Maltron Ltd, 15 Orchard Lane, East Molesey, Surrey KT8 0BN. Telephone: 01-398 3265.

DIRECT TEXT AND PICTURE INPUT

□ Tecmar's Escan lets you put artwork or documents into an IBM PC or compatible without redrawing or retyping. The £1,995 device can also convert typewritten text into ASCII so that it can be used directly by a standard word-processing package.

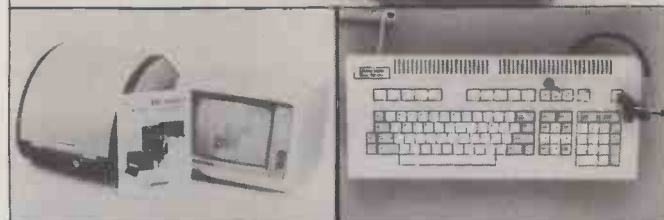
Escan can cope with documents measuring up to 8.5in. by 14in. Scanning reduces your original to a 120 dot per inch bit-mapped image, which is transferred to a file held on your PC. Captured images take up quite a lot of space, so Tecmar recommends you have a hard disc.

Once you have the captured image on disc you can then perform a number of different operations on it. For instance, you could place a handwritten signature or drawings into an existing word-processing document. Escan comes with software which lets you do this with documents from packages such as WordStar and Multimate.

The Escan software also allows you to convert text documents into ASCII files. At present the software supports four common typewriter founts: Courier 10, Prestige Elite, Pica and Letter Gothic. It also supports two optical character recognition founts, OCR-A and OCR-B. More founts are promised for later releases of the software. Escan also lets you reduce a

Input Update

Ian Stobie selects some of the alternatives to the conventional keyboard.



Top: The radical Maltron keyboard. Middle left: Tecmar's Escan. Middle right: Keytronic speech-recognition keyboard. Above: Ellinor's Touch Window screen fits in front of VDUs.

scan image into a form suitable for transmission via a modem to a facsimile machine. At the moment the software supports Group 3 fax compression. Again, more fax formats are promised for a later release.

More details from Tecmar International Ltd, Westward House, Bramshall, Uttoxeter, Staffordshire ST14 5DN. Telephone: (08893) 2275.

MULTI-FOUNT OCR

□ Typereader is designed to scan an A4 page containing text in a variety of type styles and sizes, and reduce it into a computer-readable ASCII file automatically.

A complete Typereader system uses a great deal of computing power and at present commands a price of around £25,000. But Typereader's developer,

Southdata, hopes to produce the system on a plug-in board in the not too distant future for around £6,000.

In its present incarnation Typereader consists of three parts. An Agfa S-200 digitiser first creates a 300 dot per inch image of the document you wish to read. This bit image is fed into a stripped-down 68020-based IMP Mentor PC. Here it is processed by the Typereader software, which is written in C and uses advanced techniques to make sense of the digitised input. Instead of comparing the measurements of a candidate character with a table of dimensions stored in memory, it makes use of more generalised descriptions of what particular characters look like.

Details from Southdata Ltd, 166 Portobello Road, London W11 2EB. Telephone: 01-727 7564.

LISTENING KEYBOARD

□ Speech recognition without modifications to your existing software is offered by the Keytronic 5152V keyboard. The £1,175 keyboard can replace the normal IBM keyboard, fitting in the same socket.

To set it up you first have to train the system to recognise your own particular voice characteristics. This involves repeating a set vocabulary a few times before using it for the first time. You then designate a string of characters as a command word. Thereafter whenever you say the command word the keyword will send the appropriate characters to the PC.

More details from Ceratech Electronics Ltd, Lenten House, 20 Lenten Street, Alton, Hampshire GU34 1HG. Telephone: (0420) 87500.

TOUCH-PAD

□ Keyport 60 provides the IBM PC with an extra 60 function keys. It consists of a touch-sensitive keypad with 60 key positions, which fits above the existing top row of keys. You can set up each position to generate a command or string of text when touched. Keyport 60 costs £165 and comes with a games adaptor to connect it to the IBM PC.

Another device working along the same lines is Keyport 300. This is a full-size touch-pad with 300 key positions. You can program them yourself, or get ready-made software and colourful printed overlays for popular programs such as WordStar, Multimate and Lotus 1-2-3. Prices are £240 for the touch-pad with PC adaptor, and £79 each for the keypad to make it work with specific software packages.

Contact Electrone Ltd, Haywood House, High Street, Pinner, Middlesex HA5 5QA. Telephone: 01-429 2433.

LOW-COST TOUCH-SCREEN

□ Touch Window is a transparent touch-sensitive screen which fits in front of your existing computer display. Working with either the IBM PC or the Apple II, it can be used instead of a mouse or light pen. The price is £220 for the IBM version, £190 for the Apple. It can also be used as a touch tablet.

Details from Ellinor Peripherals Ltd, Arkwright Road, Reading, Berkshire RG2 0LS. Telephone: (0734) 863417.

Image Processing

Simon Beesley looks at the latest, affordable devices which combine the simplicity of a word processor with the versatility of a music sequencer to bring video-imaging techniques out of the specialist studio and into the office.

One significant feature of Commodore's Amiga is that it includes a composite-video input jack, as well as a variety of video output sockets. This opens up all sorts of possibilities for inputting TV signals from a video tape recorder, a camera or even another computer. So far computer manufacturers have largely ignored the potential for interfacing a micro to video. Few personal computers lend themselves to graphics applications of this kind.

However, there are several routes to enhancing a micro's graphics in this way. One is to hook it up to a video digitiser which converts an analogue video signal into a digital form acceptable to your micro's screen RAM.

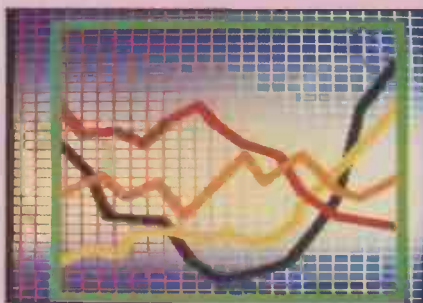
Single-frame digitisers for micros — from the BBC up to the IBM PC and Macintosh — are now comparatively cheap. They usually take several seconds to scan an image and produce a digital picture with a finite number of grey shades, from solid black to pure white. As most micros cannot display different levels of grey, digitiser software needs to simulate grey scales by means of pixel patterns.

MACVISION

Macvision, for example, digitises images for the Macintosh at eight bits per pixel, giving a 256-level grey scale. The result is a picture which comes fairly close to photographic realism — much closer, certainly, than any picture you could produce by hand.

Another route to enhanced graphics involves linking a micro to a separate graphics processor. In this case the micro merely acts as a host to a more powerful system. IO Research and Digisolve both manufacture boards which can be used with the IBM PC, Apricot machines and the BBC model B. IO Research's Pluto II card, based on an 8088 processor with 512K RAM, offers a 768-by-576 resolution and 256 colours from a palette of 16 million.

The problem here though is that it is not enough to buy a graphics board on its own. If you want to use it for serious applications, you will need to add a high-quality colour



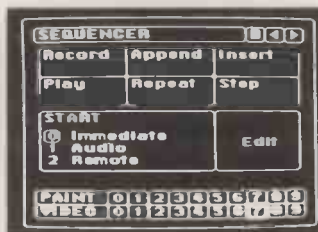
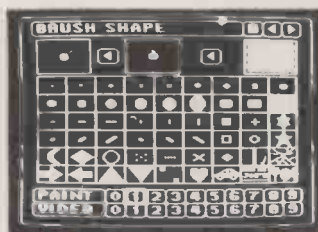
Different planes can be layered one on top of another using CVI, so that you can mix digitised and analogue video images together with graphics drawn using the paintbox facility. Once an image is frozen it can then be panned, zoomed and duplicated using the cut and-paste facility. All the effects are in real-time.

monitor, an input device such as a digitising tablet, and appropriate software.

PLB Ltd puts together complete systems using Pluto II and the BBC model B. With a second processor the BBC package turns out to be faster than the equivalent system on an Apricot. Priced at around £5,000, PLB's System 2 includes sophisticated paintbox software with which you can create high-resolution images suitable for making prints or colour slides.

Going one step further, you can add a colour digitiser which can convert frames in

Although the CVI is a stand-alone unit, it can be interfaced to micros via an RS-232.



real time — a frame grabber — and a genlock board. This last item lets you superimpose computer graphics on video. With this kit you will be able to produce the sort of digital video effects which are used for TV title sequences, provided you can develop the software to co-ordinate all these functions. The total price will probably be over £10,000.

Rather different from any of these devices is Fairlight's Computer Video Instrument (CVI), sold in the U.K. by Syco Video for £4,950. Fairlight is the Australian company which introduced the first reasonably priced sound sampler and synthesiser. The company claims that the CVI will be as useful a tool for video producers, artists and enthusiasts as the synthesiser was for rock musicians.

Although it can be controlled by another computer via its RS-232 interface, the CVI is primarily a stand-alone device. It consists of a single board connected to a control panel. There is no keyboard, simply a set of buttons, 10 sliders, and at the right a graphic pad. In its simplest configuration, you can run it with a colour monitor and a video tape recorder or camera.

Fairlight is cagey about the details of the CVI's design. The specification sheet says only that it has 32K ROM, 128K RAM and an eight-bit processor, a 2MHz 6809. In fact the 6809 acts as a controller for several video processor chips as well as all the components needed for two-way interfacing to video: PAL and SPG coders, genlock and a frame grabber, among others.

Describing just what the CVI does is an equally difficult task. Within its price range this machine is unique. It is both a paintbox system and a video effects processor, complete with 32K of software in ROM.

FIELD GRABBER

For a start, it has a real-time colour frame grabber — or, to be more accurate, a field grabber since it digitises only one of the two interlaced fields in a frame. Linked to a video camera or tape recorder, it displays digitised colour images in real time, 25 frames a second. At 256 by 256 pixels the resolution is fairly low, and a static picture on a PC at this resolution would look a little crude. But the CVI offers 4,096 simultaneous colours, which makes a considerable difference.

Where a TV picture gives a smooth gradation of colours, the digitised image tends to show different shades as distinct areas of colour, as if they were marked out by contour lines. There is also a noticeable amount of aliasing, whereby diagonal lines appear jagged. None of this, however,

The CVI video system runs using a simple menu-driven approach to provide a visual analogue to music sequencing.

makes as much difference as you might think.

What makes it particularly impressive is that it can be combined with analogue video or computer-generated graphics, or both. The stencil option allows the user to outline an area of the screen which will act as a window, on either digitised or analogue pictures.

One way of defining a stencil — or in film terms, a matte — is via the chroma key facility. This allows you to pick out a shape using a particular colour as a key. Say, for example, you have recorded a snooker match on your domestic VTR. You then play it back through the CVI. Provided the background colour is sufficiently different, you can now isolate the image of an object, or even of one of the players, and digitise it. Or you can invert the stencil to open up a window within the low-resolution picture, on a patch of TV-quality action.

SOUND ON VISION

These effects are in real time: live digitised video overlaid on live analogue video. Freezing a frame or a stencil provides all sorts of other possibilities. Once frozen, an image can be Panned, Zoomed, and duplicated with the cut-and-paste facility. There is even an option for using sound input to control an image. So, for example, you could freeze part of your snooker recording and then trigger bursts of live action with a drum beat.

The other aspect of the CVI is its paintbox facility. This operates with the same number of colours and the same pixel resolution as the frame grabber. Though not as extensive as dedicated paintbox packages like PLB's, it is more sophisticated than anything you will find on a personal computer. You draw or paint using the graphic pad. A series of paint menus offer a host of options for selecting brush shape, text, paint type, symmetry, line and circle draw, and so on.

The main limitation of the paint facility is that its 256-by-256 resolution is too low to create finely detailed pictures. On the other hand, there is an immense range of different colours on-screen. These colour controls can allow you to control the hue, saturation, value and depth or transparency of any colours on-screen. These colour control can also be applied to live and still digitised images. But what makes the CVI's paintbox really useful is that it can combine with analogue and digital video. In other words, you have three different picture planes on-screen at the same time.

Fairlight is presenting the CVI as a video composer, the video equivalent of its Computer Music Instrument. The analogy cannot be taken too far, yet there are several similarities between the two devices. For one thing, the CVI includes a sequencer which has more or less the same function as musical sequencers, allowing you to record, edit and replay a sequence of control actions. The sequencer can record up to a 1,000 changes made to the front-panel controls, and then stores them on tape.

This is one of the CVI's most powerful features. A simple application for it would be to create an animated business-graphics display. The sequencer records movements on the graphic pad, so you could set up a grid and draw a line graph, store it and replay it later. For more complex displays the sequencer can exploit the CVI's preset facility. There are 100 factory presets, which supply a range of instant effects, to which you can add your own.

To give an idea of what the CVI is capable of, it is worth quoting the manual on some of the factory presets. Preset 83 gives "a music controlled colour tunnel emanating from the centre of the screen over a live image". Preset 30 "pixelates a live digital image": it increases the size of each pixel, while lowering the resolution. The label for Preset 9's effect is "under-over slide colourise", which means it "slices live action between a slowly sliding, colourised, foreground and background".

As rock musician Pete Townsend points out in Syco's brochure, the CVI's main attraction is its immediacy. Hitherto, digital image processing has been the preserve of video studios using banks of complex equipment operated by experts. With the CVI the novice can manipulate video images and see the results instantly. It is also a fraction of the price of any other comparable system. **PC**

FAIRLIGHT CVI

Description: stand-alone video effects processor and paintbox system

Processor: eight-bit 6809 running at 2MHz

Memory: 128K RAM, 32K ROM

Interfaces: RS-232C, two RGB inputs, two composite-video inputs, RGB and composite-video output, expansion bus, stencil I/O, audio input

Field store: 256 x 256 pixels, 14 bit planes, 4,096 colours

Price: £4,950

Supplier: Syco Video, 20 Conduit Place, London W2 1HS. Telephone: 01-724 2451

Available: now

Thunderscan

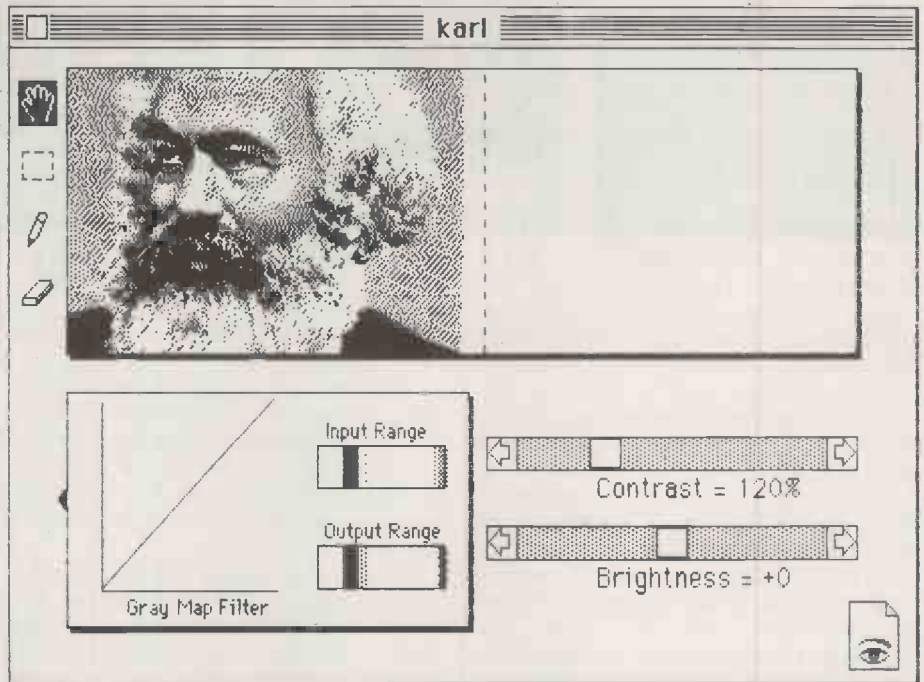
Joanne Bennett tests out a device which will scan anything you can roll through an Imagewriter, and convert it to digitised graphics on the Mac.

Thunderscan is the first of a new type of personal publishing device. It is a scanner which converts pictures into digital format for storage in a personal computer, in this case the Macintosh. The digital image can then be manipulated using Thunderscan software or Macpaint, or merged with Macwrite documents or Pagemaker.

A lens focuses on to the picture you wish to record. Two LEDS light up the image, and software translates the analogue image into a digital form. Thunderscan renders the digital image into shades of grey, which produces an effect similar to a newspaper illustration. A line-drawing effect is also possible.

The main restraint on resolution, and therefore quality, is memory. Many more bytes are needed to represent even the simplest picture than are required for a page of text. You can use Thunderscan with the 128K Macintosh, but for the best results it really requires a 512K Fat Mac. With a 128K Mac you may find that you can scan an image and edit it, but are then left with insufficient memory to print it out. Thunderscan is particularly greedy of memory because it creates images shaded in 32 different grey levels. Nevertheless, it can create quite detailed images, albeit fairly small ones.

Thunderscan consists of one 3.5in. floppy disc, a scanning device and an adaptor box which turns the Apple Imagewriter into a digital picture-input device. The scanner is a small plastic box of similar size and appearance to the ribbon cartridge. To install it into the printer you simply remove the ribbon cartridge and replace it with the scanner. The scanner contains a lens, which can be adjusted using a small knob situated on the top, and two LEDs that illuminate



Thunderscan allows you to manipulate images using Macpaint tools such as the rubber and pencil.

the original. It moves sideways in a similar fashion and at a speed comparable to that of the ribbon cartridge when it is printing out graphics. The lid of the Imagewriter does not leave enough room to accommodate the movement of the scanner's cable, so Thunderscan comes with a replacement lid.

The remaining piece of hardware is an adaptor box which plugs into the printer port at the back of the Mac. The printer cable is then plugged into the adaptor. The scanner is hard wired to the adaptor box, which has a two-way switch, one way for scanning and the other for printing. There are also some strips of white plastic tape. You stick one piece to the left-hand edge of the printer platen to tell the scanner that it has reached the end of a line.

Setting up Thunderscan is tricky at first, but easy when you know how. You first remove the paper from your printer and replace the ribbon cartridge by the scanner. You then place your original in the printer. The manual recommends you should only scan matt material for the best results, but I found it worked well with glossy pictures too.



SPECIFICATION

Description: image-digitising scanner
Hardware required: Apple Macintosh 128K and Imagewriter printer; a 512K Mac is desirable
Price: £249
Manufacturer: Thunderware Inc. of Orinda, California
U.K. supplier: P&P Micro Distributors, Todd Hall Road, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744
Available: now

When you have the picture in the printer, ready to scan, you focus the lens. This is achieved with the help of a number displayed in a window on the Mac's screen. You position the picture so that the nose of the scanner lens is over the whitest part of

IMAGE SCANNER

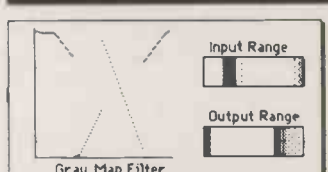
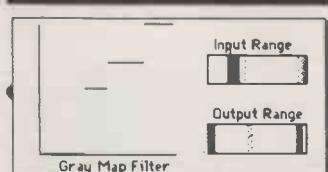
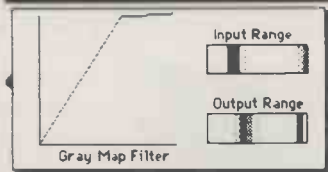
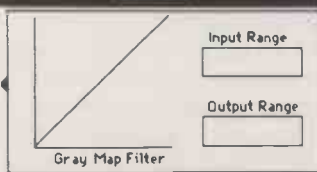


Thunderscan lies at the low end of a market where a number of higher-resolution, business-orientated image digitisers are now becoming available. They include the Japanese Microtek Image Scanner, which is sold through ARS Microsystems.

It comes in two versions — 200 and 300 dots per inch (dpi) — costing £1,600 and £2,100 respectively. It works with the IBM PC and compatibles, and the Macintosh. With the aid of an add-on board, it can also be used as a facsimile machine. A flatbed photocopier-style version will be available soon.

The Image Scanner is faster than the Thunderscan, operating at 40 characters per second (cps) on the IBM PC and 145cps on the PC/AT. A third model, the MS-300A, operates at data transmission speed, but requires at least 512K of memory and a hard disc for best results; to scan an A4 page at 300dpi you need over a megabyte.

Despite these valuable enhancements, the Image Scanner's uses are essentially the same as Thunderscan's: in-house and low-level publishing rather than professional quality. Its operation and software facilities are also similar to Thunderscan's,



You can experiment on a captured image to get the clearest output — or go for unusual special effects.



the image you are scanning. You then focus the scanner by adjusting the knob until the number displayed reaches its maximum value. It is not necessary to repeat this procedure with every picture you scan, but it is advisable as conditions may change. It is important to focus the lens before each Thunderscan session.

Once the focusing is done, you can start to scan the picture. First you wind the picture back on the platen. Then you enter another window on the Mac where you have to define the area of the page that you wish to scan. You use a screen bar and mouse to adjust the magnification factor; the default

Images from a variety of sources can be used to brighten up Macwrite documents. value is 1:1 or same size reproduction.

You may find that a message appears telling you that the area you have chosen to scan is too large, or that it is too large for Grey Map manipulation after scanning. If so, you can elect to scan a smaller area, or to reduce the image once it has been scanned. A reduced image tends to be somewhat enhanced. You will be stuck with the size of image that you choose at this point unless you transfer your image to Macpaint or Macdraw.

A couple of pictures I entered had to be

rescanned when lines appeared marring them. You can abort a scanning session and start again when this happens.

You can lighten an image that is too dark by adjusting the brightness and contrast controls. If the background is scrappy, you can clean it up with the aid of a Macpaint-type rubber and pencil. You can even adjust these commands in the middle of entering a picture. Once you have selected the optimum settings for these controls you can then apply them to all or part of the image using the Halftone option.

You can alter the shading to turn your image into a line-only drawing. Another control applies maximum contrast to your scanned image. You can also redistribute the grey shades using the Grey Map Filter. Its use is shown in the examples above.

The Thunderscan software incorporates Macpaint tools such as rubber and pencil, and Fatbits, which allows you to blow up your image to bit-map size for close editing. Images can be saved as Macpaint files or as Grey Map files. Macpaint storage saves the current picture as it appears on-screen as a standard Macpaint image, which you can transfer to the Macpaint application and manipulate.

The manual is of the heavily illustrated,

(continued on next page)

although it does lack the Grey Map Filter. It comes with Istar demonstration software, which is about as user-friendly as a cornered beast. However, the U.K. supplier, ARS, says the Image Scanner will be incorporated in OEM systems and integrated with professional Mac Pagemaker-type software and Gem graphics. ARS also says it plans to release OCR software soon to allow the Image Scanner to scan text and turn it into WordStar files. Up to 22 fonts are promised.

The Image Scanner's hardware consists of a large box which houses an Intel 8086 processor and utilises a parallel interface; there is room for a serial interface and fax board. The scanner consists of a fluorescent tube to illuminate the image, and a light-sensitive, charge-coupled device which transmits the image to the PC for translation into digital form. I viewed the Image Scanner on a Sperry IBM-compatible, and operation on-screen is similar to that of Thunderscan.

Contact ARS Microsystems Ltd, Doman Road, Camberley, Surrey GU15 3DF. Telephone: (0276) 685005.

(continued from previous page)

hand-holding variety. However, it does contain a lot of errors which the manufacturer has corrected in a separate erratum supplement. Rewriting the manual with all the mistakes corrected would make it a lot easier to use.

Another complaint concerns the software, which contains a number of bugs. Thunderscan is not a new product, so it should not be so bug-ridden. It is irritating to be continually informed of system errors and you keep thinking your work is going to disappear.

Another limitation is that with a picture bigger than a few inches square you have to work out which part you want scanned by guesswork, relating a window to the image in the printer/scanner. Thunderscan could not cope with an 8in. by 10in. page on any 128K Mac. To accommodate it I had to reduce my image down to about two-thirds.

In spite of these problems, Thunderscan is an exciting and remarkable product, and fairly cheap. However, a question mark hangs over its usefulness for business purposes. For all its attractions it is something of an artistic toy. It is being marketed as a photosetting tool, part of a low-level, PC-based personal-publishing system. But unless you are trying to achieve particularly artistic effects, you would do better cutting and pasting original photographs and illustrations.

Thunderscan would be useful for in-house publishing or for storing images, for example. It can also be used with a modem as a cheap fax machine to send images direct to other Macintoshes. As a low-level publishing tool, it is suitable for company newsletters, internal documents, simple brochures and for reproducing maps and sales diagrams.

THUNDERSCAN				
OVERDICT				
	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 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"/>

An excellent product — except for the bugs.

CONCLUSIONS

- Thunderscan is an innovative and useful product for adding a visual element to personal-publishing material on the Mac.
- It is a pleasure to use, and requires no technical knowledge.
- It is slow, and the images it produces look rather fuzzy.
- The software contains a number of annoying bugs, and the manual ought to be reprinted with corrections incorporated into the text.

Which Modem?

As more and more people hook up their micros to a telephone line so the number of devices enabling them to do so increases. **Steve Gold** examines some of the options available.



Buying a modem has never been easier. Unfortunately, as in most supplier-led electronic industries, there is no one type to buy. There are three main speeds used by modems: 300 baud full-duplex, 1,200/75 baud, and 1,200 baud full-duplex.

When modems first became commercially widespread in the 1970s, the technology was only capable of economically manufacturing 300 baud modems for use of the public switched telephone network (PSTN). Indeed, it was the PSTN that caused the problem by not being able to handle high-speed data transmissions. Once modems became widespread, at least in the industrial/office environment, the 300 baud full-duplex modem settled down to enjoy a brief heyday as the commonly accepted standard.

Unfortunately for the consumer today, British Telecom invented a wheeze by which we could all be tempted to use the considerable spare telephone capacity during the evening and weekends. That wheeze was called Prestel and, while not becoming the runaway commercial success that BT hoped it might be, it succeeded in establishing a second modem generation standard of 1,200/75 baud.

Speeds of 300 baud, or roughly 30 characters per second, were seen by BT as an acceptably low speed of transmission to sell to the waiting masses. At the same time, the latest high-speed 1,200 baud full-duplex modems becoming available were very expensive — well into four figures — and the PSTN was not capable of the high bandwidth required for such modem use. The command structure of Prestel was menu-driven, so the simple numeric commands required could be fed back to the Prestel computer at a relatively low speed, thus freeing the incoming bandwidth for high-

speed data transmission. Thus the concept of 1,200/75 baud was born.

The last few months has seen the commercial production of 1,200 baud full-duplex modems for home and small-business consumption. They are a far cry from the crude 1,200/75 baud acoustic modems seen in the early 1980s. While 1,200 baud full-duplex modems are still relatively expensive, the PSTN has become capable of accepting such bandwidths across the majority of the network. So now we see the age of the third generation of consumer modems: the 1,200 baud models, which also go under the name V-22.

If you are buying a modem for business use you should select a high-speed model in preference to the first-generation speed of 300 baud. The cost of using telephone time, even at the local rate, is quite high during office hours. Certain database systems, such as Dialog and The Source, charge extra for 1,200 baud access. The improved data rate more than compensates for the difference if you spend most of your on-line time downloading data. In practice a substantial proportion of your time will be spent waiting or thinking so the benefits of higher data rate may turn out not to be as great as they appeared at first sight.

Where you simply want to download data 1,200/75 baud should suffice in most cases. Conversely, since 300 baud modems can upload at 300 baud, as compared with the 75 baud back channel of the typical Prestel modem, where the bulk of data is to be uploaded to the host system, a 300 baud modem becomes the more attractive alternative.

The cost of a typical 300 baud or 1,200/75 baud modem has come down to £100 or less. At the same time, the cost of a multi-standard modem — one capable of both speeds — is falling to just £100.

PATTERNS OF USE

Since different use patterns can have such a marked effect on your overall cost, you should do the necessary sums to work out which type is best for you. For all but the lightest business use, a multi-standard modem will be the logical choice. For home users, low initial cost may be more important. While the cost of a typical 300 baud, 1,200/75 baud or multi-standard modem continues to fall, the cost of the new 1,200 baud full-duplex models is still comparatively high.

An auto-answer facility is essential for anyone who is considering setting up their own dial-up database to become a host system. Auto-answer options usually raise the price of a modem considerably, usually by at least £50 and often considerably more. Alternatively, BT can supply a phone line which takes only incoming calls and has no dial tone. If a host computer is holding such a line permanently, anyone calling will automatically be given a modem tone. With a bit of nifty programming on the host computer, even the most basic of modems can be turned into a dial-up host system.

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MODEMS

MANUFACTURER	MODEL	SPEED (baud)	ADDITIONAL FUNCTIONS	PRICE	COMMENTS
Apple	Apple Modem	300/300, 1,200/75	Autodial. Auto-answer	£295	Well documented and easy to set up with Mac or Apple II
Dacom	Buzzbox	300/300	Auto-answer optional upgrade. Battery or mains powered. Compact	£60	Useful for portables. Auto-answer model costs £85
Dacom	2123AD	300/300, 1,200/75	Tone and pulse autodial. Auto-answer. Dacom ARQ error correction	£225	Suitable for PABX use
Dacom	2323GT	300/300, 1,200/75	Tone and pulse autodial. Auto-answer. On-board memory for auto log-on.	£395	State-of-the-art modem
Dacom	PC range	300/300 1,200/75	Tone and pulse autodial. Auto-answer. On-board memory for auto log-on, etc. Tap model also has 1,200 baud full-duplex	£350	Similar to 2123 series but built as IBM-compatible expansion cards. Top model costs £525
Data Design	CT-1200/1200	1,200/1,200 full-duplex	Auto-answer, with optional tone or pulse autodial. Uses proprietary data-packing error correction	£447	Unsuitable for Prestel use
Data Design	CT-2400	2,400 half-duplex	As for CT-1200/1200	£345	Cheap method for high-speed micro-to-micro data transfer
Data Design	CT-300	300/300	As for CT-1200/1200	£224	High-priced basic modem with proprietary error-correction
Data Design	CT-1200	1,200 half-duplex	As for CT-1200/1200	£224	As for CT-300
Data Design	CT-1200/75	1,200/75	As for CT-1200/1200	£195	Expensive modem with videotext capability. Error correction of limited use in viewdata applications
Daraflex	Intelligent World Modem	300/300 full-duplex, 600 and 1,200 half-duplex and 1,200/75 and 75/1,200	Tone or pulse autodial. Auto-answer. Includes intelligent software for PC and similar for VT-100 emulation plus XModem file transfer. Internal and external units available	£399	Excellent all-in modem on an IBM-compatible expansion card. Available as external unit, price £499
Dowty	Minimo 300	300/300	Detects line drop	£95	Compact, very basic modem, now superseded
Dowty	Minimo 3/12	300/300 1,200/75, and 75/1,200	Detects line drop	£145	Very basic multi-speed modem
Dowty	Minimo Plus 1	300/300, 1,200/75 75/1,200	Auto-answer. Detects line drop	£195	Auto-answer version of Minimo 3/12
Dowty	Minimo Plus 2	300/300 1,200/75 75/1,200	Tone and pulse autodial. Auto-answer. Intelligent software allows auto log-on plus Epad error-correction system for PSS, etc. Detects line drop. Software emulates VT-52, VT-100 and Prestel terminal	£245	Epad facility is extremely useful. Undercuts Miracle WS-3000 considerably
Dowty	Quattro/Steebeck 2422	300/300 1,200/75 and 75/1,200 1,200 and 2,400 full-duplex	Auto-answer. Tone or pulse autodial. Software included for VT-52, VT-100 and Prestel	£795	Equivalent of Miracle WS-3000. Proven in use. Includes software. State-of-the-art high-speed modem
Dowty	SB series	300/300 or 1,200/75 or 75/1,200	Optional modules for auto-answer, autodial facilities. 1,200 baud full-duplex, and 1,200 and 1,400 half-duplex versions also available	£234	Modular modems installed by firm to retain BT approval. Good for custom applications. Full-duplex model £495, half-duplex £317
Gandalf	Access SAM 24	1,200 and 2,400 full-duplex	Optional Link 2000 software. Auto-answer and tone or pulse autodial. Specified for business applications	£800-plus	Price depends on number of units and options. Not cheap, but quality very high. Suitable for LAN systems
GEC	Datachat 1223	1,200/75 and 75/1,200 1,200 half-duplex	Line powered. Optional software for a variety of computers	£86.91	Line-powered modem. Very simple; suitable primarily for videotext applications, particularly for portable PCs
GEC	Datachat 1223A	1,200/75 and 75/1,200 1,200 half-duplex	Auto-answer. Line powered. Optional software for variety of computers	£125.69	As for Datachat 1223. Could be used as viewdata host
GEC	2422B	1,200 and 2,400	Auto-answer. Line-drop detect	£749.95	Could be useful with intelligent software
Hayes	Smartmodem 1200	1,200 full-duplex	Auto-answer. Tone or pulse autodial. Optional software	£575	Late entry to U.K. market for Hayes. Over-priced and under-powered, even for the name. PC card version coming soon
Interlekt	Portman	300/300 1,200/75 and 75/1,200 1,200 half-duplex	Auto-answer. Senses line drop	£173	Basic modem. Semi-intelligent but capable of interfacing to a wide variety of computers. Low power consumption
Interlekt	Prospect	300/300 1,200/75 and 75/1,200 1,200 half-duplex	Senses line drop	£125	Stripped-down version of Portman. Very basic. Good value for money
Interlekt	Berkely	300/300 1,200/75 and 75/1,200 1,200 half-duplex	Auto-answer. Tone and pulse autodial. Capable of intelligent log-on with suitable software	£350	Expensive upgrade path from the firm's other two models
Lion Systems	4142	300/300 1,200/75 and 75/1,200 1,200 half-duplex	Auto-answer. Tone or pulse autodial	£365	Expensive
Lion Systems	4240	1,200 and 2,400 full-duplex	Async and sync tones. Auto-answer. Tone or pulse autodial	£750	Cheapest approved async/sync modem available

Miracle Technology	WS-2000	300/300, 1,200/75, and 75/1,200 600 and 1,200 half-duplex	Optional auto-answer, pulse autodial boards. Export model has Bell tones	£105	Flexible multi-standard modem with excellent expansion facilities. Superseded by the WS-3000. Good value
Miracle Technology	WS-3000	300/300, 1,200/75 and 75/1,200 600 and 1,200 half-duplex	Auto-answer. Tone or pulse autodial. Modular upgrades to 1,200 baud and/or 2,400 full-duplex	£295	First approved modem to offer 300 baud Bell tones. Good expansion possibilities. Buffered RS-232 allows split baud rates. 1,200/1,200 version costs £495; 2,400/2,400 version costs £650
Modem House	Voyager 7	300/300, 1,200/75 and 75/1,200 1,200 half-duplex	Auto-answer. Pulse autodial. Various computer/software packages available	£150-plus	Not yet in full production. Could offer excellent value for money
Modular Technology	V series	300/300, 1,200 half-duplex 75/1,200 1,200 full-duplex 2,400 half-duplex	Series of single-speed modems. Auto-answer and autodial available where appropriate	£179 to £495	Modular upgrades available. Rugged design. Cheaper rack-mounted versions also available
Modular Technology	M-4000 series	300/300, 1,200/75 and 75/1,200 1,200 half-duplex	Bell tones on export model. Auto-answer. Optional tone or pulse autodial. On-board memory	tba	Industrial-grade modems
Pace	Nightingale	300/300, 1,200/75 and 75/1,200	Optional auto-answer/autodial pulse board. Software available for BBC Micro	£102	Rather dated modem, suitable mainly for BBC Micro
Pace	Kingfisher	300/300, 1,200/75 and 75/1,200	Full LCD front-panel display. Auto-answer. Tone and pulse autodial. Buffered RS-232 interface. Hayes command compatible. Intelligent on-board memory. Centronics printer output. Optional upgrades to 1,200 and 2,400 full-duplex	£295	LCD display panel and printer output are nice touches. Not yet in commercial production
PC Communications	Breakout 2123	300/300, 1,200/75 and 75/1,200 1,200 half-duplex	Auto-answer. Tone and pulse autodial. Uses Dacom ARQ standard for error checking. Software included. Buffered RS-232	£499	Plug-in modem card. Excellent value for money. Formerly called Missing Link
PC Communications	Mass Breakout 2123	300/300, 1,200/75 and 75/1,200 1,200 half-duplex	Auto-answer. Tone or pulse autodial. Software in price offers intelligent logging-on, XModem, Dacom ARQ, and Kermit file transfer	£575	Enhanced version of the Breakout 2123
Racal-Milgo	CP-2123	300/300, 1,200/75, 1,200 half-duplex	Auto-answer. Autodial. Software included for intelligent log-on. Proprietary error checking for 1,200 half-duplex mode	£450	Expensive. Plug-in card version available at same price
Tandata	TM-512	300/300, 1,200/75 and 75/1,200	Auto-answer. Autodial. On-board memory for autodial and log-on. Buffered RS-232. Epad error correction	£295	Software available for a variety of micros. Uses non-Hayes command set
Tandata	TM-602	300/300, 1,200/75 and 75/1,200 1,200 full-duplex	As for TM-512	£465	A 1,200/1,200 version of the TM-512
Telindus	Daisy	300/300, 1,200/75, 1,200 half-duplex	Hardware-selectable parity/bit length, etc. on front panel	tba	Very compact modems from a new Belgian company. Could prove competitive
Thorn Datatech	VX-543	300/300, 1,200/75, 1,200 half-duplex	Auto-answer. Tone or pulse autodial. Software offers XModem file transfer	£375	Good value for money. Compact design. Datatalk software included in price

SUPPLIERS

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Dacom Systems Corina Eost, Sunrise Parkway, Linford Wood, Milton Keynes MK14 6LU. Telephone: (0908) 675511.	Gandalf Communications 19 Kingsland Grange, Woolston, Warrington, Cheshire WA1 4RW. Telephone: (0925) 818484.	Interlekt Electronics DCE House, Bessemer Crescent, Rabons Lane, Aylesbury, Buckinghamshire HP19 3TH. Telephone: (0296) 88165.	Modem House , 70 Longbrook Street, Exeter, Devon EX4 6AP. Telephone: (0392) 213355.	Racal Milgo Landata House, Station Road, Hook, Basingstoke, Hampshire RG27 9PE. Telephone: (0256) 723911.
Dataflex Design , Merton Park House, 2 Jubilee Way, London SW19 3XD. Telephone: 01-543 6417.	GEC Elstree Way, Borehamwood, Hertfordshire WD6 1RX. Telephone: 01-953 2030.	Lion Systems Developments Oxford Road, Stokenchurch, High Wycombe, Buckinghamshire HP14 3SX. Telephone: (024026) 3951.	Modular Technology Zygol House, Telford Road, Bicester, Oxfordshire OX6 0XB Telephone: (0869) 253361.	Tandata Marketing Albert Road North, Malvern, Worcestershire WR14 2TL. Telephone: (06845) 68421.
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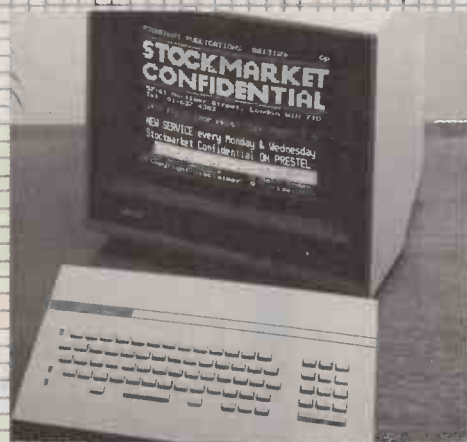
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OPEN FILE CONTENTS

In Open File we offer programming tips and free software to key in — from demonstration routines to ready-to-use business programs. As well as major feature programs, every month we publish a selection of software written by our readers.

We welcome serious software for any of the micro systems listed opposite, especially short routines and utilities. Programs can be in Basic, Pascal or any other language.

Submissions should include a brief description which explains what your program does, and how it does it. If possible it should be typed, with lines double-spaced. We need a disc of the program, and a printed listing from a fully debugged, working program; hand-written listings cannot be accepted.

When printing listings, please remember to use a new ribbon or double-intensity printing — faint listings reproduce badly. Use plain paper only, and try to list the program across either a 35-character or a 70-character width. Make sure all special graphics, inverse-video characters or any other non-standard symbols are listed correctly, or else include Rem statements to explain them.

Each program listing or disc must have your name and address on it, or we cannot promise its safe return. A stamped addressed envelope is appreciated.

If you write in with a comment, correction or enquiry please state the machine and the program title.

We pay at least £10 for any programs used, or £35 per page and pro rata for part pages.

OPEN FILE MONITORS

Amstrad	Ian Stobie
Apple	Bill Hill
BBC	Nicholas McCutcheon
Commodore	Mike Todd
CP/M	Glyn Moody
dBase	Ian Stobie
IBM PC	Glyn Moody
Tandy	John Wellsman
Research Machines	Ian Stobie
Sharp	John Hooper
Sinclair QL	Glyn Moody

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TELEX ON GOLD

BT's electronic mail service can be used to send and receive telex messages. Jack Schofield explains how

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John Lewis on how to customise your front end

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REGRESSION

Owen and Daniel Bishop's series of programs for the BBC Micro. This month: scattergrams and regression

AS WELL as offering the country's premier electronic-mail service, Telecom Gold also provides access to a large number of other facilities. These include games, an editor, a spelling checker, a diary called Tickler, an on-line directory called Gold.Users, electronic forms, the bankers clearing house (Bacs), the electronic Official Air-line Guide (OAG), a translation and typesetting group called Textnet, a daily computer newsletter called Infomatics Daily Bulletin (IDB), an agricultural database, the world of Lotus 1-2-3, and a large number of more or less interesting commputer programs, from magic tricks to statistics. Typing OAG, IDB, Lotus, etc. at the prompt should get you into the public databases, but they are very expensive. Agra Europe is private.

In addition, two of Gold's proliferating Prime super-minis host subsystems which are actually within the Telecom Gold system, but have their own distinctive menu-driven front ends. These are Microlink on system 72, and The Times Network for Schools on system 01.

The Microlink or MAG group, run by Database Publications, has a number of extra facilities which are accessed by selecting them from a menu: NN for news, RR for reviews, WW for a Who's Who in microcomputing, XX for telesoftware, and so on. FL is Floralink, which enables you to send flowers to your loved one. BR lets you book tickets for British Rail trains. Microlink also has its own separate noticeboard which includes sections on Adventure and Communications. Epsolink is run within Microlink.

The Times Network for Schools has its own databases and information sections of special interest. The most noticeable difference is the use of Como files to produce frame-orientated displays with large text and colour graphics. This makes it look like the appalling Prestel system, except that for those who log on at 300/300 instead of 1,200/75 it is even slower.

However, for many people the most important extra service Telecom Gold offers is the facility to send and receive telexes. Telex is an old-fashioned, slow, primitive, expensive and unreliable method of sending messages. It is kept going only by the ignorance and stupidity of telex users — plus the fact that there are about 1.6 million of them. It is therefore useful to be able to send telexes to those companies that are too backward to have discovered email.

A Telecom Gold mailbox can be

TELEX ON GOLD

The Telecom Gold system can do much more than transmit electronic mail. **Jack Schofield** investigates what else it has to offer, and explains how you can use it as a cheap medium for telex messages.

TELEX SESSION SAMPLE

>TELEX

Command: SEND TEST NI GLON
Night Transmission Requested.

More Recipients?
1 Message(s) Queued.
Message Reference Number is 16

Command: where 16

Time Now 01:31

Message Number: 16 UK
G 8811746(GUARDNG)
ATTN JACK SCHOFIELD - COMPUTER GUARDIAN
Sent. (556 Characters) 1 Attempts.
(ok: 811746GUARDN G)
From Text File TEST At 01:21 on
20/12/85

Finished.

Command: QUIT

----- (Later) -----

>
Express letter call from TELEX

>MAIL RE UNRE

To: JNL020
From: TELEX
Posted: Fri 20-Dec-85 1:51 GMT Sys 83
(1)
Subject: Telex 17 Has Been Sent.

--More--

Action Required: DEL

>TELEX DEL SENT

Finished.

Here the pre-loaded file called Test has been sent by telex at the cheap night rate using only one command, Send Test NI Glon. Ten minutes later the command Where 16 was used, and this shows the telex was correctly addressed with both name and number, then sent. My Param.Ini file makes the system automatically notify me that the telex has been sent by mailing an express letter, as shown.

validated free of charge to send and receive telexes. There is a 50p charge for each telex received, and a storage overhead of around £2 per month. But compare this with the £1,250 to £3,000 cost of a dedicated telex machine, and the hundreds of pounds a year for a telex line and its virtues for all but the largest users are obvious.

Telecom Gold also makes sending telexes simpler. However, problems sometimes arise because email systems can handle sophisticated things like lower-case characters and obscure, unusual signs like the exclamation mark, the double quote and the £ sign. In email lines can be up to 120 characters long, whereas in creaking old telex the maximum is 69. There are other obscure differences too.

The latest Telecom Gold software will skate over virtually all these problems. It automatically changes your text into capitals, and there is even a way to change upper-case text received into lower case. The software will retain long lines, and do clever things like changing an illegal

£300

into POUNDS 300

or <>

into ()

It will also automatically provide the G code, which identifies the U.K. You just press Return at the prompt Country-name or Country-code. Quote marks are no longer needed for the Attn line which identifies the recipient.

When sending a telex, you can type

TELEX

then INPUT

and be prompted for Text. You can type it in or, better, load it instantly from an existing file by typing

LOADFILENAME

and then .S for Send, just as in Mail. The best approach is to avoid the eight separate responses you have to enter to send a telex, and bypass all the prompts. To do this you need a .RF file which provides short codes, just like Mail.Ref does in Mail. You also need to have uploaded the telex you want to send as a text file.

First, write your telex off-line,

.RF. FILE

```
>TY .RF.
```

```
GLON TLX G 8811746 (GUARDNG) 'ATTN JACK SCHOFIELD - COMPUTER GUARDIAN'
GMAN TLX G 668920 (EVNEWS6) 'ATTN GUARDIAN FEATURES - COMPUTER GUARDIAN'
PP TLX G 32157 'ATTN DOMINIC BOLAND - EDITOR, PRACTICAL PHOTOGRAPHY'
PCOM TLX G 892084 (BISPRS6) 'ATTN GLYN MOODY - PRACTCAL COMPUTING, L307'
```

The short-form file for telex users allows telexes to be sent using personalised names such as PCOM rather than by filling each item every time. It is essential to follow this format precisely when specifying your own .RF. file.

then upload it. There are three ways you can do this. The first method uses the built-in line editor. You type Ed, then upload the text at the Input prompt, press Return for Edit, and save it using

```
SA FILENAME
```

Watch out that your text does not contain any lines that comprise only a Carriage Return, because this is the command the editor uses to switch between Input and Edit. If you want a blank line, you must include a space and a Return, not just a Return.

An alternative is Xmit, on which there is an Info file. Xmit works but it uses prompts, which make it long and boring. The third option is to use the email facility. If you want to upload a telex called Filename, you simply type

```
MAIL ME SU FILENAME
```

and you will get the Text: prompt, so you can upload. The advantage of this method is that the Linesize command in your Param.Ini file will automatically insert Carriage Returns for you. Having mailed yourself the text, you type

```
'MAIL READ UNREAD
```

Unless you really want to read it again, type

```
SAVE TEXT IN FILENAME
```

at the

```
— More —
```

prompt. This removes the mail headers and uploads your text.

When you have a text file to edit, you can simply type JU to have it justified to the default width of 60 characters. This prevents you getting funny line lengths when you feed 80-character email into the 69-character telex system.

Now make sure the recipient is included in a file of code numbers called .RF.; the sample reproduced above shows the exact format that must be used. Otherwise, .RF. works just like Mail.Ref, described last month.

Suppose the *Guardian's* London office telex number has been defined as Glon, and you want to telex a file called Filename. The command to do this, entered at the Command: prompt, is simply

```
SEND FILENAME GLON
```

You can save money by using the slightly more complex

```
SEND FILENAME NI GLON
```

where the NI specifies night transmission. The telex will then be queued and sent after 8p.m., which is 10 percent cheaper than prime time.

There are two ways to find out if your telex has been sent. Each telex is given a number, so when in Telex you can type

```
WHERE 16
```

or whatever, and the system will report whether that telex has been queued, sent, aborted or abandoned. Gold makes several attempts before giving up.

The simpler method is to include the separate line

```
TELEX ARX
```

in your Param.Ini file. The system then automatically sends an express letter to your mailbox to notify you when it has been sent. This is important, partly because you want to know and partly because queued telexes occupy storage and storage costs money. Go back and type.

```
DEL SENT
```

when the telex has been sent.

Being validated for telex involves an overhead of eight or nine blocks of storage. Typing

```
TELEX STORAGE
```

at the prompt lists five blocks as shown, but Mess and Queu take another three. A .RF. file would be the ninth, bringing the storage cost to £1.80 per month.

There are many other telex commands, including Requeue, Get, Abort, Uwrap and Check. The Telex system is complex, and regular users should read the Info files and Telecom Gold's separate *Telex Reference Manual*.

Beyond Telex there are a number of commands which are far from essential, but which will benefit some users. One useful extra is Como, a command which enables you to create a file which is a complete record of activity on your mailbox. To start the process, type

```
COMO FILENAME
```

at the prompt. After this all keystrokes and responses will be

captured. Finally type

```
COMO -END
```

You will then have an ASCII file called Filename, as you can see by typing F for a list of files.

Como is useful if you cannot get something to work. You simply record your attempts and use

```
.LOAD FILENAME
```

to mail the Como file to your system manager for advice. You can send yourself a copy using

```
.BC ME
```

before .S, then delete the Como file to reduce storage. Users of Microlink, Epsonlink, Textnet, TTNS, etc. will find that a Como file records system commands that they did not type in or see on their screens at the time.

If you have a file that you want to ensure is not accidentally deleted you can use the Protect command.

```
PROTECT FILENAME 0
```

protects the file so well that you cannot even read it. If you want to make a file read-only use

```
PROTECT FILENAME 1
```

Cunningly, the command for unprotect is also Protect, followed by a number which varies according to the type of protection being removed. Under most circumstances

```
PROTECT 7
```

will do the trick.

If you share a mailbox with other people and you don't want them to read confidential mail, the sender can password protect it using

```
.PA XXXX
```

before sending it. The XXXX here is, of course, the password. Bear in mind that the recipient has to know the password in order to read the letter, which effectively means it must be pre-arranged. For even more protection Gold provides an encryption program which produces a file that is not even ASCII — see Info Cipher. Of course, you cannot mail non-ASCII files.

It is also possible to save typing by setting up your own abbreviations on the system, such as NBD for Noticebd or MQS for Mail Quick Scan. To do this you have to

create a file of abbreviations using a command of the form

```
AB JNL020 > FILENAME -CREATE
```

but with your own box number, obviously. You can then add abbreviations using -AC for Add Command as follows:

```
AB -AC MSU MAIL SCAN UNREAD
```

or whatever. Typing simply MSU will then provide a scan list of unread mail.

Abbreviations need to be turned on before they can be used. If you have used the file name Abfile, for example, this would be done by typing

```
AB ABFILE -ON
```

at the system prompt. More sensibly this line would be inserted into your C-ID file, as explained last month, so that it is turned on automatically whenever you log on. Type

```
AB -HELP
```

if you want more details.

You can have fun misusing your Abfile to redefine the system commands so that, for example, the command Rabbit replaces the command Chat, or Zap replaces D for Delete:

```
AB -AC RABBIT CHAT
```


```
AB -AC ZAP D
```

For further personalisation, determined explorers may discover a simple way to change the prompt from the ordinary > via Param.Ini. I use

```
JACK >
```

and an error prompt of

```
OOPS >
```

Now that you are not just following the prompts on a menu-driven mail system the possibilities are almost endless. After all, as a Telecom Gold user you have access to a Prime supermini with several megabytes of RAM and tens of megabytes of hard-disc space. At night it is all yours to play with for just £2.10 per hour. 

TELEX COSTS

Telex hardware costs from £1,250, with British Telecom's own machines priced between £2,000 and £3,000 for 16K or 32K models. It costs £88 to install a telex line, than £85 per quarter rental. Usage and connect charges go on top.

With Telecom Gold, the cheapest usable hardware is about £350, including a modem. It costs £40 to sign on to Gold, though many communicating micros come with free boxes. Usage charges go on top, the minimum charge being £10 per month. Telecom Gold also charges you 50p to receive a telex via your mailbox.

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MICROSIGHT

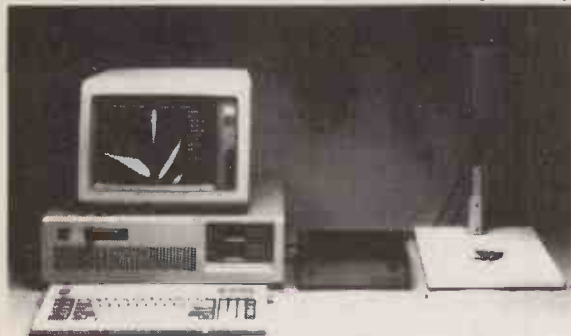
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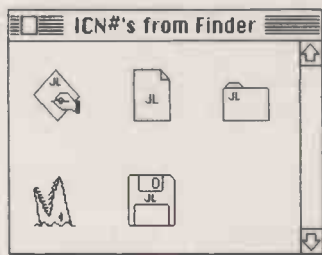
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FLASH MAC

John Lewis explains how to alter the Mac's desk top to suit your own needs and taste.

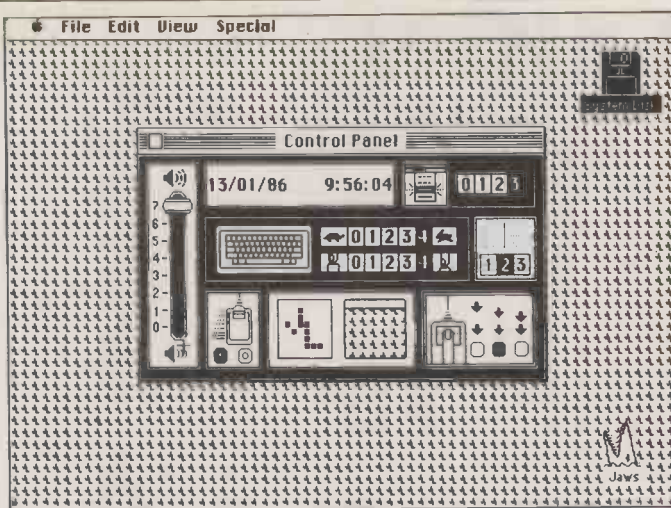
ONE OF THE many nice things about the Macintosh is that you can personalise it to suit yourself. Using the desk accessory known as Control Panel you can adjust the volume of the loudspeaker, change the rates of cursor blinking, alter the keyboard touch, and change the pattern of the desk top. To do this you clear the little left-hand screen and then, using a similar technique to that in Macpaint's Fatbits, draw the picture or background you require. The right-hand screen gives a preview of what you are designing. When you are satisfied, you just click in that screen and the whole background of your desk top changes to the new pattern.



It is possible to personalise your Mac even further if you have Resedit or Redit. These public-domain programs are available from some Apple dealers or may be downloaded from bulletin boards — for details see my article in last month's *Practical Computing*.

Both programs give you access into the Resource forks of applications so that you can alter the icons, menus and founts to reflect your own wishes. Resedit will be used for the examples that follow; in most cases you could also use Redit, though its presentation is slightly different. In case anything should go wrong while you are practising, copy a System Folder and Resedit on to a new disc and use this for the experiments.

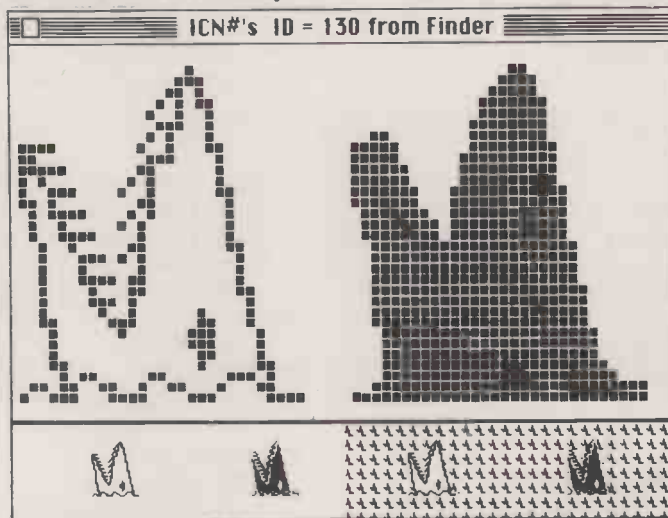
When you open Resedit from the desk top, a directory of the various applications and programs available on that disc will be shown. By clicking in the Close box you can eject the disc and insert another if you wish to work on programs on a different disc. Select



Above: You can use the Control Panel to personalise the Mac. Below left: The Resedit directory of files and applications.



Above right: The Contents of Finder displayed using Redit. Below: The new waste icon, Jaws.



the application you wish to personalise and double click. The Finder program is one of those available within Resedit. It has its own directory, and to select any constituent you just double click on its name. A window will then open with its contents. If this new window has the heading Data and contains hexadecimal code, close it quickly. At this stage it is best left alone.

The first entry worth opening is ICN# so double click this to get a pictorial directory of all the icons in Finder. Double click the first one to display a window showing the

pixel image of the icon, its shadow and a couple of icons on a plain background and against the desk top. Using the mouse you can add or delete pixels as you do in Fatbits to see what effect this has on the icon. If you like, you can delete both pixel images and start drawing your own. The image on the right should be a filled-in shadow of the detailed drawing on the left. It is slightly easier to use the Redit program for this, since once you have completed the left-hand drawing you can copy it over to the right and fill in. When you have finished, close the drawing

window, and close the ICN# directory.

If you have altered the Wastebasket you must also change the menu items relating to it so select Menu from the finder directory and double click on

MENU ID=5

The menus are numbered from the left; 5 is the special menu containing the Empty command. Scroll down the items until you come to the relevant one, delete the existing entry and retype the new one.

At the same time you can alter the attributes of the item as it will appear in the pull-down menu. You can select whether the text is condensed, shadow, outlined, underlined, bold or even italic, and you can also specify which Command key corresponds to a menu item.

It will also be necessary to alter the contents of STR#, which holds error messages, etc., to reflect the fact that Wastebasket is now Jaws. With these changes made, click the close boxes, answer Yes to the question whether you want to save the Finder before closing, and you will be back at the Resedit directory.

The System file can also be changed in a similar fashion. Curs allows you to change the cursors, while Font gives a list of the founts. By double clicking one of these you can see the pixel image of the character and its ASCII number. Again, its quite easy to change or add to the character set. One possibility is to add some of your own characters or drawings in the blank spaces; I have found $\frac{1}{2}$ and $\frac{3}{4}$ to be very useful. You will have to move the tabs at the bottom of the window to open up sufficient space for the character you have created. With the latest version of Keycaps you can actually see which keys correspond to the additions. It is worth noting that the first fount shown in Font Directory is the default fount for the menus, etc., usually Chicago. By experimenting with Cut, Copy and Paste it is possible to change this to, say, New York or one of the more exotic founts such as Carroll.

Also in the System directory you will find Icon, not to be confused with ICN#. Again you select one by double clicking, and then alter it. Pat gives the desk top and scroll bars background, and you can personalise these too if you wish.

To achieve a consistent desk top you will have to personalise all the icons in all the applications, but once you get in the swing of things it need not take very long. If you do not recognise a particular heading try opening it to see what is there.

REGRESSION

Continuing their series of programs for the BBC model B, **Owen Bishop** and **Daniel Bishop** explain how you can plot a scattergram to detect the correlation between two sets of measurements.

THIS MONTH we describe another chart-drawing program which helps to make data easier to understand. This program is for data which consists of two measurements for each case, which may be an object, an individual or an event.

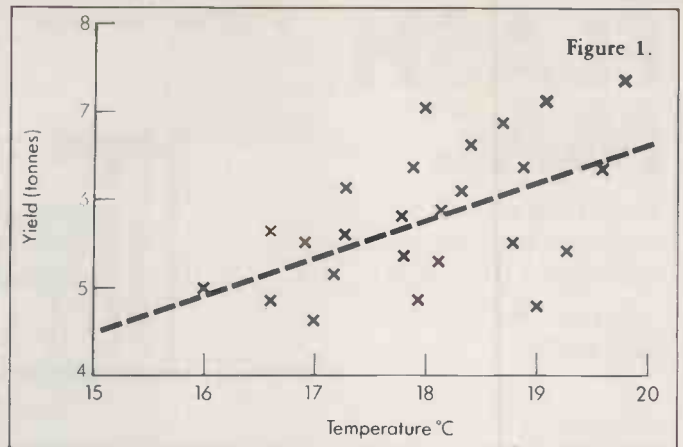
For example, imagine an industrial process to manufacture batches of a certain chemical. The temperature of the factory varies according to the weather and season. It is found that the yield of the process varies from batch to batch. Is temperature a factor which affects the yield? In other words, are temperature and yield correlated? If they are correlated, it might be profitable to maintain the temperature at a fixed level during processing.

The obvious way of trying to decide this issue is to measure temperatures and yields for a number of batches. You can then draw a scattergram of the results, which would look like figure 1. Temperature is measured horizontally — that is, along the x-

axis — while yield is measured vertically, along the y-axis. Each point on the scattergram represents one batch. If the correlation is exact, the points appear along a definite line across the diagram.

More often the points are scattered irregularly over the diagram, forming a cloud. The shape of the cloud may tell you all you need to know. For example, if the cloud is well-defined and aligned as in figure 2, it is immediately clear that the two measurements are correlated. Moreover, increasing quantity 1 — the temperature in this example — is associated with an increase in quantity 2, the yield.

This is called positive correlation. In view of this result you might consider installing heaters to increase batch yields in future, but a word of caution is due here. The effect is demonstrated only for the range of temperatures covered by the original data. You cannot assume that even higher temperatures will necessarily result in



even higher yields. There could be a sudden downturn in yield at higher temperatures — or even an explosion.

Other kinds of data might show strong negative correlation, as in figure 3. Here the value of quantity 2 decreases as quantity 1 increases. Occasionally, when correlation is weaker, the results are less clear. If there is no correlation a cloud like figure 4 is produced.

The original example shown in figure 1, appears to fall within the last category, though there is just a hint of positive correlation. You should not go ahead and install heating equipment without a closer look at the figures; you need to resort to a statistical test.

This month's program not only plots a scattergram of the data, but

also calculates various statistics associated with it. One of these is the correlation coefficient, represented by the symbol *r*. Because of the way in which it is calculated *r* always has a value in the range -1 to +1. Values close to -1 and +1 indicate strong correlation in one direction or the other. Values around zero indicate weak correlation or no correlation.

With the data of figure 1 the program calculates the value of *r* as 0.545. To discover exactly what this means you can refer to tables of critical values of *r*, such as can be found in books of statistical tables and in many books on statistics. However, in general terms, if *r* is more than 0.5 — or less than -0.5 for negative correlation — and the scattergram has at least 10 points, the correlation is statistically sig-

SCATTERGRAM

LIST

```

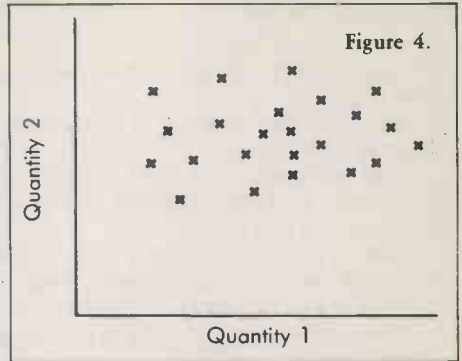
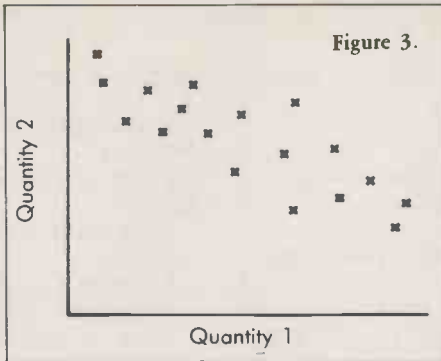
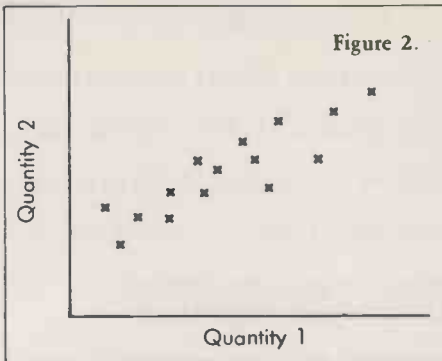
10 REM- SCATTERGRAM
20 REM- A Statistical Utility Program
30 REM- -----
40 REM- by Owen and Daniel Bishop
50 REM- -----
60 REM- Version 1.0 - 4/10/85
70 REM- For the BBC Micro Model B
80 REM- -----
90 *FX4,1
100 *TV 255,1
110 FR=0:L#=STRING$(10,CHR$32)
120 MODE7:PROCcol:PRINT"SCATTERGRAM"
130 PROCbtm:PROCcol:PRINT "Enter name
of file to be loaded":PROCalpha("(max 7
letters): ",7)
140 ON ERROR PROCferror:VDU31,15,0:FR
OCcls:GOTO 130
150 FILE$=QR$:A=OPENIN FILE$
160 INPUT#A,DF$,NC,NR
170 IF NC<2 THEN CLOSE#0:VDU31,15,0:PR
OCcls:PROCbtm:VDU7:PROCcol:PRINT "AT LEA
ST 2 COLUMNS OF DATA REQUIRED":FOR L=1 T
O 5000:NEXT:GOTO 130
180 PROCtop
190 DIM SC(NC,NR),CL$(NC),RL$(NR),DP(1
2)
200 INPUT#A,CW,LC
210 IF LC=0 THEN 230

```

```

220 FOR J=1 TO NC:INPUT#A,CL$(J):NEXT
230 INPUT#A,LR
240 IF LR=0 THEN 260
250 FOR J=1 TO NR:INPUT#A,RL$(J):NEXT
260 FOR J=1 TO NR:FOR K=1 TO NC:INPUT#
A,SC(K,J):NEXT:NEXT
270 FOR J=1 TO NC:INPUT#A,DP(J):NEXT:I
NPUT#A,DP$
280 CLOSE#0:ON ERROR OFF
290 QR=0:FOR J=1 TO NC:IF DP(J)>QR THE
N QR=DP(J)
300 NEXT
310 SW=36-7*LR:CC=INT(SW/CW):IF NC<CC
THEN CC=NC
320 CS=0:RS=0:HB=4+7*LR
330 IF LR=0 AND NR>=100 THEN HB=5
340 RB=NR+4:IF NR>16 THEN RB=24
350 VDU31,0,2:PROCcls
360 PROCbtm
370 RD=16:IF NR-RS<RD THEN RD=NR-RS
380 CD=CC:IF NC-CS<CD THEN CD=NC-CS
390 PROCcolumns:PROCrows:PROCdata
400 *FX21,0
410 VDU31,39,21:K$=GET$
420 IF K$=CHR$139 AND RS>0 THEN RS=RS-
16:GOTO 370
430 IF K$=CHR$136 AND CS>0 THEN CS=CS-
CC:GOTO 370
440 IF K$=CHR$137 AND CS+CD<NC THEN CS

```



nificant. In this example, with 25 points, the value of r is such that there is a better than 99 percent chance of there really being a positive correlation between temperature and yield.

The program also calculates the equation of a particular straight line that passes through the cloud, and plots this line on the screen. This line is called the regression line of y on x , and represents the average value of quantity 2 that might be expected for each value of quantity 1. It is plotted as a dashed line in figure 1.

The program displays the equation of the line on the screen. In the example, the equation is

$$y = 0.42x - 1.8$$

What this means is that if, for example, you heat the batch to 19°C, the expected average yield is:

$$0.42 \times 19 - 1.8$$

or 6.18 tonnes per batch.

You are now in a position to calculate expected yields for any other temperatures within the range of the data. Taking heating costs into account, you can then calculate the most economical operating temperature.

Before using the Scattergram program you should run Datamaker to prepare the data file, as explained in the February issue. This program normally uses a data table of two columns with a row for each individual or object. It can also accept a table with more than two columns and display scattergrams for any selected pair of columns. You might, for example, also measure the amount of a particular constituent, such as a preservative, mixed with each batch and then analyse the data to see if the yield is correlated with the amount added.

Load and run the program, then place the data disc in the drive and

type in the field name of the data file. The data table appears, as in Datamaker. If the table is too large for the screen, you may use the cursor keys to examine other parts of it. When you are ready to proceed, press the space bar. You are asked to decide which column of data is to be plotted in the x direction, and which in the y direction.

The scattergram is displayed, with points corresponding to each pair of values plotted within a grid. The values of x corresponding to the left and right edges of the grid and the values of y corresponding to the top and bottom of the grid are given below the grid, together with the value of r . If necessary, a statistical table can be used to determine the significance of the correlation. The number of degrees of freedom to be used when consulting the table of r is one less than the number of rows

of data in your original table.

The equation at the bottom of the screen is the regression equation for y on x . If the coefficient of x happens to be very small, it may sometimes be displayed in exponential form. For example,

$$3E-2x$$

is to be read as $3E-2$ times x or $0.003x$. The line of this equation is plotted on the scattergram.

Press the space bar to return to the data table and select other pairs of columns, or to exchange columns to obtain the regression of x on y .

All the programs in this series, along with five others, are available on a single-sided 40-track 5.25in. disc. The price is £20 including postage and 15 percent VAT. Please send your order to Owen Bishop, c/o Practical Computing; cheques should be made payable to Owen Bishop.

```
=CS+CD:GOTO 370
450 IF K$=CHR$138 AND RS+RD<NR THEN RS
=RS+RD:GOTO 370
460 IF K$="R" THEN RUN
470 IF K$="S" AND FR=1 THEN 700
480 IF K$<>CHR$32 THEN VDU7:GOTO 400
490 PROCbtm
500 VDU31,0,20:PROCnum("Which column a
long X-axis (1-"+STR$(NC)+")?",1,1,1,NC)
:CX=QN
510 VDU31,0,21:PROCnum("Which column a
long Y-axis (1-"+STR$(NC)+")?",1,1,1,NC)
:CY=QN
520 IF CX=CY THEN PROCbtm:VDU31,0,22:P
ROCcol:PRINT"You have chosen the same co
lumn twice!":GOTO 500
530 CLS
540 VDU31,6,8:PROCcol:PRINT"Calculatin
g - please wait"
550 XL=1E38:YL=1E38:XH=-1E-38:YH=-1E-3
8: SX=0:SY=0:QX=0:QY=0:QZ=0:NT=0
560 FOR J=1 TO NR
570 IF SC(CX,J)=1E-29 OR SC(CY,J)=1E-2
9 THEN 670
580 X=SC(CX,J):Y=SC(CY,J)
590 NT=NT+1
600 IF X<XL THEN XL=X
610 IF Y<YL THEN YL=Y
620 IF X>XH THEN XH=X
```

```
630 IF Y>YH THEN YH=Y
640 SX=SX+X:SY=SY+Y
650 X2=X*X:Y2=Y*Y:XY=X*Y
660 QX=QX+X2:QY=QY+Y2:QZ=QZ+XY
670 NEXT
680 IF NT=0 THEN NT=NR
690 MX=SX/NT:MY=SY/NT
700 MODE4:VDU19,1,2,0,0,0
710 MOVE 0,192:DRAW 1279,192:DRAW 1279
,1023:DRAW 0,1023:DRAW 0,192
720 FOR J=0 TO 1279 STEP 128
730 MOVE J,192:DRAW J,208:MOVE J,1023:
DRAW J,1007
740 NEXT
750 FOR J=192 TO 1023 STEP 83.2
760 MOVE 0,J:DRAW 16,J:MOVE 1279,J:DRA
W 1263,J
770 NEXT
780 PRINTTAB(11,27)"Fitting the line"
790 LX=XL*.95-.1:LY=YL*.95-.1:HX=XH*1.
05+.1:HY=YH*1.05+.1:XX=HX-LX:YY=HY-LY
800 FOR J=1 TO NR
810 IF SC(CX,J)=1E-29 OR SC(CY,J)=1E-2
9 THEN 840
820 X=SC(CX,J):Y=SC(CY,J)
830 PX=INT((X-LX)/XX*279):PY=159-INT((
Y-LY)/YY*159):PLOT69,FNx(PX),FNy(PY)
840 NEXT J
```

(continued on next page)

SCATTERGRAM

(continued from previous page)

```

850 VX=QX-SX*SX/NT:VY=QY-SY*SY/NT:VZ=Q
Z-SX*SY/NT
860 R1=SQR(VX*VY):R=VZ/R1
870 B=VZ/VX
880 XP=INT((MX-LX)/XX*279):YP=159-INT(
(MY-LY)/YY*159):BB=B*XX/YY*.57
890 X1=XP:X2=XP
900 X1=X1-2:Y1=YP+(XP-X1)*BB:IFX1>2 AN
D Y1>0 AND Y1<159 THEN 900
910 X1=X1+2:Y1=INT(YP+(XP-X1)*BB)
920 X2=X2+2:Y2=YP+(XP-X2)*BB:IF X2<278
AND Y2<159 AND Y2>0 THEN 920
930 X2=X2-2:Y2=INT(YP+(XP-X2)*BB)
940 MOVE FNx(X1),FNy(Y1):DRAW FNx(X2),
FNy(Y2)
950 VDU31,11,27:PRINTSTRING$(16,CHR$32
):VDU30
960 PRINTTAB(0,27)"X-axis (col.":CX;")
:";FNqr(LX);" to ";FNqr(HX):PRINT"Y-axi
s (col.":CY;"):";FNqr(LY);" to ";FNqr(H
Y)
970 PRINT"Regression coefficient, R =
";INT((R+.0005)*1000)/1000
980 C=MY-B*MX:S$=" + ":IF C<0 THEN S$=
"_"
990 C=ABS(C)
1000 PRINT"y = ";INT((B+.005)*100)/100;
"x ";S$;" ";FNqr(C)
1010 *FX21,0
1020 REPEAT:A=GET:UNTIL A=32
1030 MODE7:PROCTOP:FR=1:GOTO 370
1040 DEF PROCTOP
1050 CLS:PROCCOL:PRINT"SCATTERGRAM":VDU
31,15,0:PRINT FILE$:VDU31,24,0:PRINT"DAT
E: ";DF$
1060 VDU31,0,1:PROCCOL:PRINT"COLS: ";NC
;SPC(2);"ROWS: ";NR
1070 ENDPROC
1080 DEF FNx(N)=INT(N*4.58)
1090 DEF FNy(N)=INT((159-N)*5.23+192)
1100 DEF FNqr(N)=INT((N+.5/10^QR)*10^QR
)/10^QR
1110 DEF PROCdata:LOCAL J,K:VDU23,1,0;0
;0;0;:FOR J=5 TO 20:VDU31,HB-1,J-1:PROCC
11:NEXT
1120 FOR J=1+CS TO CD+CS:HH=HB-1+(J-CS-
1)*CW
1130 FOR K=1+RS TO RD+RS
1140 IF SC(J,K)=1E-29 THEN 1160 ELSE @%
=&01020000A+(DP(J)*%&100):A$=STR$(SC(J,K))
:IF RIGHT$(A$,1)=". "THEN A$=LEFT$(A$,LEN
(A$)-1)
1150 VDU31,HH-1,3+K-RS:PRINT RIGHT$(L$+
A$,CW):@%=&90A
1160 NEXT:NEXT
1170 VDU23,1,1;0;0;0;
1180 ENDPROC
1190 DEF PROCcolumns:LOCAL J:VDU23,1,0;
0;0;0;:VDU31,0,2:PROCC11:VDU31,0,3:PROCC
11
1200 VDU31,0,2:FOR J=1 TO CD
1210 VDU31,(HB-1+(J-1)*CW),2:PRINT;J+CS
;
1220 NEXT
1230 IF LC=0 THEN VDU23,1,1;0;0;0;:ENDP
ROC
1240 VDU31,0,3:FOR J=1 TO CD
1250 VDU31,(HB-1+(J-1)*CW),3:PRINTCL$(J
+CS);
1260 NEXT:VDU23,1,1;0;0;0;:ENDPROC
1270 DEF PROCrows:LOCAL K:VDU23,1,0;0;0

```

```

;0;:FOR K=5 TO 20:VDU31,0,K-1:PROCC11:NE
XT
1280 FOR K=1 TO RD:VDU31,0,K+3:PRINT;K+
RS:NEXT
1290 IF LR=0 THEN VDU23,1,1;0;0;0;:ENDP
ROC
1300 FOR K=1 TO RD:VDU31,3,3+K:PRINT RL
$(K+RS)
1310 NEXT:VDU23,1,1;0;0;0;:ENDPROC
1320 DEF PROCnum(Q$,Q1,Q2,Q3,Q4)
1330 *FX21,0
1340 PROCCOL:PRINT Q$;:INPUT""QN$
1350 QN=VAL(QN$)
1360 IF QN=0 AND QN$<>"0" THEN 1390
1370 IF QN<>INT(QN) THEN 1390
1380 IF (Q3=0 OR QN<=Q4) AND (Q1=0 OR Q
N>=Q2) THEN ENDPROC
1390 PROCline
1400 GOTO 1330
1410 ENDPROC
1420 DEF PROCalpha(Q$,Q1)
1430 *FX21,0
1440 PROCCOL:PRINT Q$;:INPUT""QR$
1450 IF LEN(QR$)<=Q1 OR Q1=0 THEN ENDP
ROC
1460 PROCline:GOTO 1430
1470 DEF PROCline:VDU11:PROCC11:VDU7:EN
DPROC
1480 DEF PROCbtm:VDU31,0,20:PROCC11:VDU
31,0,20:ENDPROC
1490 DEF PROCCOL
1500 PRINT CHR$130;
1510 ENDPROC
1520 DEF PROCC11
1530 LOCAL CRS%,V,H
1540 V=VPOS:H=POS
1550 CRS%=999-H-(40*V)
1560 VDU23,1,0;0;0;0;
1570 REPEAT:IF CRS%<255 THEN 1590
1580 CRS%=CRS%-255:PRINTSTRING$(255,CHR
$32);
1590 UNTIL CRS%<255
1600 PRINTSTRING$(CRS%,CHR$32);
1610 VDU31,H,V
1620 VDU23,1,1;0;0;0;
1630 ENDPROC
1640 DEF PROCC11
1650 LOCAL V,H
1660 V=VPOS:H=POS
1670 PRINT STRING$(40-H,CHR$32);
1680 VDU31,H,V
1690 ENDPROC
1700 DEF PROCferror
1710 ON ERROR OFF
1720 CLOSE#0
1730 VDU7
1740 IF ERR>44 OR ERR=6 THEN 1780
1750 CLS:VDU11:REPORT:PRINT " at line "
;ERL
1760 *FX4,0
1770 END
1780 PROCbtm:IF ERR=222 THEN PRINT"No s
uch file";:PROCCOL ELSE VDU11:REPORT:PRO
CCOL
1790 PRINT" error. ":PROCCOL:PRINT"Pres
s SPACEBAR, when you are ready "
1800 *FX21,0
1810 REPEAT:A=GET:UNTIL A=32
1820 VDU11,11:PROCC11
1830 ENDPROC

```



OPEN FILE

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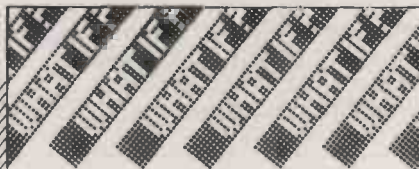
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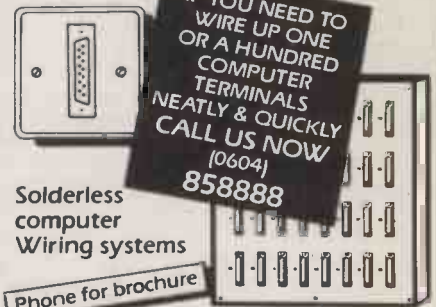
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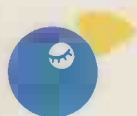
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