

# PRACTICAL COMPUTING

FOR BUSINESS AND PROFESSIONAL MICRO USERS



## THE ROUTE TO INTEGRATION

**SOFTWARE** Macworks • Travelling Sidekick

**HARDWARE** ICL DRS-300 • Mitsubishi G-500

**FEATURES** Bugs • Supershopping

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# PRACTICAL COMPUTING

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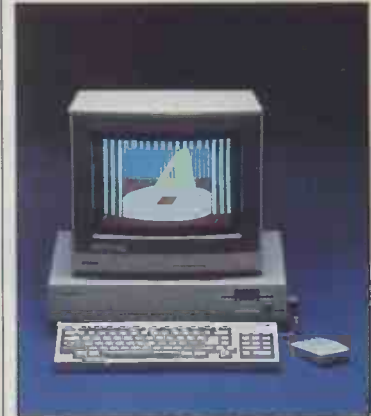


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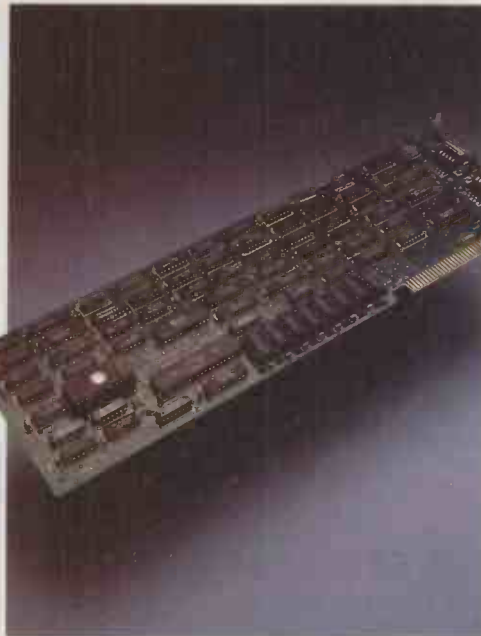
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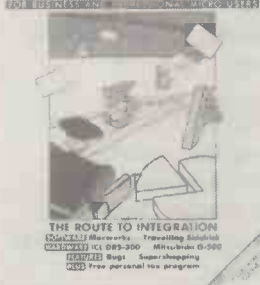


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Every effort is made to check articles and listings but PC cannot guarantee that programs will run and can accept no responsibility for any errors.

## A CRIMINAL ACT

**Y**ou may be breaking the law when you read this. At the time of writing, the deadline for registration under the Data Protection Act had just passed. Of some 250,000 registration packs sent out, only 110,000 had been returned completed. Since it is hard to believe that the other 140,000 computer installations are exempt, or that people sent for packs out of idle curiosity, it is likely that there are a lot of criminals out there.

Obviously the Data Protection Registrar, Eric Howe, is in a difficult position. To prosecute everyone who registers late is clearly impossible. On the other hand, to postpone the evil day indefinitely would make a mockery of the Act.

Some compromise is needed and Howe is taking a sensible line. He intends to be fair about late registration: the indication is that the later registrations arrive, the dimmer the view he will take of them and the better the excuses will need to be. Eventually there will come a point where examples will be made. When happens, and the first howls of pain are heard throughout the land as people are parted from their money, then the Act will begin to be taken more seriously.

The question which needs to be answered is why it has proved such a fiasco so far. After all, the Data Protection Act represents the first legislation devoted to one of the key elements in modern society, and one which will steadily and inexorably grow in importance.

Various reasons have been advanced for the public's indifference. These include the unwieldy, complicated nature of the Act and the hassle of registration. There are also suggestions that the main problem lies with the micro user, who tends to be computer-illiterate and should have been left out of scope of the Act which is more appropriate for big machines.

Yet most new legislation is initially intimidating, but people still cope. They certainly do not boycott it. As for micro users being naive, they probably have a far better idea of the data on their own machines than most DP managers have of theirs. Also, excluding micros is impossible since tomorrow's desk-top machine will be little different from today's departmental mini or even mainframe, such are the advances of technology.

Perhaps a crucial reason for the wholesale indifference towards the Data Protection Act is that it is fundamentally dishonest. It was not brought before Parliament in response to the growing and justified fears about the misuse of personal data held on computers. Rather it was because the government is obliged to ratify a Council of Europe convention on the processing of such data, otherwise the U.K.

would be deemed a dirty data haven. It would then have been shunned by international financial institutions, among others, with fatal consequences for the British economy. All the really interesting personal data held on the computers — that belonging to the government — is largely exempt. For all the diligent efforts by lobby groups during its passage through Parliament, the Act remains a piece of window dressing. Is it any wonder that the public should be sceptical?

Of course, those who dismiss the Registry as a toothless government stool pigeon are wide of the mark. Eric Howe is doubtless counting on the fact that large institutions which grow very rapidly have their own momentum and natural evolution. It is for this reason that full registration is so important. The larger the base of registered users, the greater the power and resources of the Data Protection Registry, and the greater the weight that is lent to the idea of independent regulation of the processing of personal data.

Registering under the Data Protection Act may seem a curious way of seeking to widen access to personal data held on government files. But it must be remembered that the computer cannot only be an instrument of surveillance and oppression. By virtue of the micro's stand-alone capabilities it can be a great agent for the distribution and democratisation of knowledge and power. The choice is yours.

## 5 YEARS AGO...

Personal Software, the company responsible for the best-selling VisiCalc program, has developed four more packages in the same vein. Like VisiCalc, probably the most used microcomputer program in the world today, the four new products will be available for most of the popular brands of microcomputer.

The new programs include VisiPlot, a high-resolution plotting and graphics package; VisiDex, a flexible personal-information system; VisiTrend/VisiPlot, a combination of the VisiPlan program together with a program for time-series manipulation, trend forecasting and descriptive statistics.

The VisiTerm program allows a personal computer to communicate with a wide variety of other machines ranging from large mainframes down to other personal computers.

The four programs have the ability to pass data between programs. For example, files created using VisiCalc can be transmitted to another computer via VisiTerm.

PC Volume 4 Issue 7

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## SPECIAL SECTION PRINTERS

New developments in printer technology are coming through every month. We look at laser and LED page printers — some very cheap, some very fast. Impact printers also come in for scrutiny, in particular the high-quality 18- and 24-pin models.

## HARDWARE

The Japanese giant Mitsubishi has launched a range of machines which could signal the beginning of a major new presence in the PC world. We look at its 40Mbyte AT-alike. There is also a review of British Telecom's interesting hybrid, the Qwertyphone office work station.

## SOFTWARE

Borland's Superkey is another memory-resident program from the makers of Sidekick; we see if it is as useful. We also review some of the latest versions of the top word processors.

## FEATURES

Is your micro shockproof? We investigate the threat static electricity can pose to your valuable files. We also look at the top names in software distribution, like P&P and Softsel, to find out where they come from and where they are going.

## TOP 10 SURVEY

Software increasingly comes in families. This month's feature looks at the top clans.

Don't miss the August issue of

# PRACTICAL COMPUTING

On sale at W H Smith and all good newsagents after 9 July.

Contents may vary due to circumstances beyond our control and are subject to change without notice

## An M-24 by any other name

THE AT&T 6300 mentioned in the perceptive May editorial about AT&T and IBM is, of course, the same machine as the Olivetti M-24. Many readers will find this information useful when installing recent U.S. software packages, where the 6300 is now frequently offered as a menu option but the M-24 is not. The M-24 is also sold under their own badges by many other firms including Xerox, Control Data and Hermes.

**JACK SCHOFIELD,**  
Sutton,  
Surrey.

## Ferranti PC-2860AT

IN THE May issue your reviewer reported problems with running Sidekick. We are sure it was an idiosyncrasy as you suggested and would like to confirm that the Ferranti PC-2860AT does run the latest version of Sidekick R1.56 at 8MHz.

Thank you for referring to the good hard-disc performance of our machine. We chose deliberately an expensive but fast disc so that not only would single users avoid being disc-bound, but also that the PC-2860AT can be used as a good performance network server.

**I G MACWHIRTER,**  
Ferranti Computer Systems,  
Oldham,  
Lancashire.

## Sanyo problems

I READ the letter from R Lister concerning WordStar on the Sanyo MBC-555 in the Ask PC column of your April issue. It may help Mr Lister if he is given the addresses for modifying WordStar legends on the bottom line via Debug. These are 50F7 hexadecimal for key 1 to 50F7 hexadecimal for key 10. Each letter of the legend is followed by a character attribute — WordStar uses "p" for inverse video.

Mr Lister wrote that he had modified the Key commands and so have I. Two very useful modifications are, first, to change key 1 to Ctrl-V or Insert, as the Help level of Ctrl-J can be entered longhand, and secondly, as my printer has only a one-line buffer, I have made key 4 into Ctrl-KPY. When used in the

**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.**

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# THE PAPERLESS OFFICE

MUCH comment has been made about why the paperless office has not materialised, yet nobody seems to have addressed the problem to find out why we are still using as much, if not more, printout than we have ever done.

For a computer installation to remove or reduce the need for paper it has to meet a number of requirements:

1. The screen should be large enough to display at least an A4 sheet vertically or horizontally viewed and giving line widths of 120 characters by 72 lines depth.
2. There should be some method of marking the data temporarily, as you would do with paper files with a pencil. For example, a touch-screen that you could use to draw a circle round relevant data. Annotations could either be stored or abandoned to choice afterwards.
3. There should be a method of scrolling backwards and forwards through pages, as you would thumb through paper files, at a speed which you could vary, say by using a joystick, or indeed in discrete jumps as you might in a manual filing system.
4. A hard copy of the screen display should be available immediately. You should be able to get it in the same time as it would take to remove a file manually, photocopy it and reinsert it — say 20 seconds. This should be achieved by pressing a dedicated key rather than going through a confusing command structure.
5. The screen should be reserved exclusively for data. All menus, help screens or command instructions should be displayed on an auxiliary screen. Nothing is more irritating to an infrequent user of the system than to have half the already tiny screen obliterated by miscellaneous instructions, none of which gives the one you are seeking.

If a system was available broadly to this specification, we might then see us heading towards a paperless office.

**COLIN DAVIS,**  
Coda Systems Ltd,  
Braintree,  
Essex.

middle of printing, it brings the printer to virtually a dead halt, which is useful when mistakes have been made. The respective key — as distinct from legend — addresses are 66E hexadecimal and 689 hexadecimal and the code 3B, 5E, 01, 16, 2A . . . 2A up to 67E for Ctrl-V. For Ctrl-KPY, the code is 3E, 61, 03, 0B, 50, 59, 2A . . . till 691.

I have several other difficulties with the Sanyo and Borland's Turbo Pascal in particular. I contacted the Sanyo Users Association and received a reply to the effect that they were only geared to answering simple questions.

Frankly, the lack of support from the serious magazines

astonishes me. I have written to Bristol Microtraders, who advertise a connection with Borland, and to Borland in the States. Yet Turbo Pascal for the Sanyo is on sale.

**P A DUVAL,**  
Theydon Bois,  
Essex.

## Atari ST Basic

IN HIS letter which appeared in the Feedback section of the February issue Jack Schofield comments favourably on the Basic Benchmark timings for the Atari 520ST. I am content to accept that the machine is four times as quick as the IBM PC, but as a dismayed purchaser of

the Atari I know that what it is doing with such speed is to garbage my files.

When records are written to a sequential file the interpreter has the habit of shuffling them all up one place, filling the vacant slot with a null string. Not content with this, when records are recovered they are often missing the first character, although for variety it is sometimes the final one which is lost and occasionally the second half of a long record is totally corrupted. The Eof, Lof and Loc functions simply do not work. In short, the Basic file-handling routines are so flawed as to be unusable.

There are lots of other novel undocumented features in Atari ST Basic, some of which are just a nuisance and can be avoided with a little care once you know of them, but others seem quite random and often result in a total system crash — usually as you are saving a program. What is more, Atari can give no indication as to when they might have available a revised Basic which actually works as it should.

**DAVID LOVERSEED,**  
Bramhall,  
Stockport.

## Data encryption

IN THE April edition of *Practical Computing* Ben Knox states that due to the 56-bit key used by the DES encryption standard it would be possible for 1,000,000 Sinclair Spectrums connected in parallel to decode any data within a few hours. It would seem that he has over estimated the power of the Spectrum.

Using Sinclair Spectrums or even a dedicated device such as the Intel 8294 data-encryption unit, the average time for decryption of an eight-byte block of information is something like 100ms.

Given a 56-bit key with 2<sup>56</sup> possible combinations, the time taken for 1,000,000 Spectrums to cycle all the possible permutations would be in the region of 230 years, not "a few hours" as stated.

If anybody was worried that their DES encrypted data was likely to be intercepted and decoded, it would be a simple matter to perform a second encryption on the encoded data using a second key. In effect this would give data encrypted with a 112-bit key, which I am sure even the CIA would have difficulty hacking.

**DAVE TAYLOR,**  
London SW18. [P]

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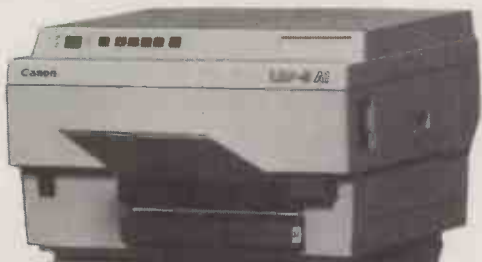
  
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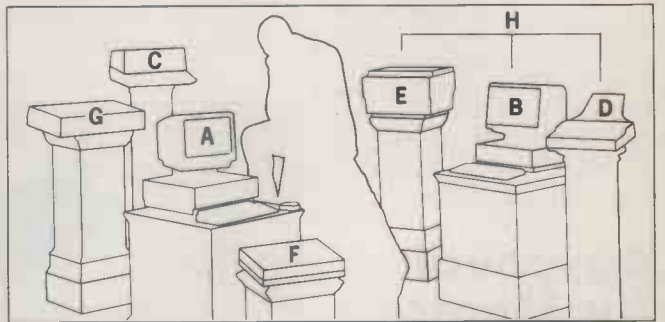
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## Price cuts for IBM clones

ZENITH DATA has reduced the prices on a range of its computers by between 3 percent and 18 percent. The 40Mbyte hard-disc AT-compatible Z-200 Advanced PC is now £4,595, down from £5,160. The price of the 20 Mbyte hard-disc version has fallen to £3,195, and that of the 1.2Mbyte floppy-only AT clone is now £2,675. The bad news on these price changes is that the monochrome monitor and cards are no longer included in the price. The monitor is available separately at £89.95; the mono and colour cards are priced at £135 and £195 respectively.

Zenith's XT-compatible range, the Z-158 Enhanced PC computers, have also had their prices cut. The 20Mbyte hard-disc model with a 360K floppy costs £2,515. The twin-floppy version is £1,995, and the price of the single-floppy machine falls to £1,735.

The Tandon PC range also comes in for some price cutting. The PCX-20 computer is reduced to £1,695, the PCA-20 is £2,695 and the PCA-30 costs £2,995. Details from Tandon Computer (U.K.) Ltd, Unit 19, Dunlop Road, Hunt End, Redditch, Worcestershire B97 5XT. Telephone: (0527) 46800.

Finally, Ferranti has announced that its AT-compatible PC-2860AT has been reduced by £353 to £3,545. Details from Ferranti Computer Systems Ltd, Detker Street, Oldham, Lancashire OL1 3XF. Telephone: 061-624 9552.

## Approval for Magic Modem

AFTER a five-month wait, the Magic Modem from Datastar Systems has finally won official approval. The approval process, which the company says has cost around £10,000, means that the modem can be used legally on the U.K. phone network.

The Magic Modem retails at £99.95 and can run at 300/300 baud and 1,200/75 baud full-duplex and 1,200 baud half-duplex. Further details available from Datastar Systems, Unicom House, 182 Royal College Street, London NW1 9NN. Telephone: 01-482 1711.

# AMIGA UK LAUNCH

COMMODORE has finally launched the Amiga in the U.K. The announcement was made at the Commodore Computer Show. The entry-level price of the Amiga is set at £1,475.

The base configuration, known as System 1, comes with an integral 3.5in. 880K floppy-disc drive, 512K RAM and colour monitor; the computer has no RF port. System 2, priced at £1,675, is an identical configuration to System 1 but with the addition of an external disc drive. The external drive and an external 5.25in. drive are also available separately, priced at £249 and £299.

Bundled with the package are the Amiga operating system, Kickstart and Workbench, together with the Amiga Tutor. Amiga Basic is contained in the Workbench. No applications programmes are currently bundled with the machine, but Commodore says it is monitoring the situation and looking at available software.

There has been widespread speculation about the target market for the machine in the U.K. This will have been further fuelled by the U.K. price announcement, which puts the Amiga outside the reach of most home users, although the company claims that around 10 percent to 20 percent of purchasers will be enthusiasts.

Commodore sees the Amiga as "a general business machine, focusing on areas of machine advantage." What this means in practice is that the machine will be targeted principally at vertical markets such as personal publishing, CAD/CAM and education. Commodore claims that there are already 80 packages available for the Amiga at launch, and expects a great deal more to become available now that the computer is on sale in the U.K.

As an aid to getting the machine accepted into the mainstream business market,

Commodore U.K. has announced its intention to market Sidecar, which has already been shown at Comdex in the U.S. This is a bolt-on box, rather like Mac Charlie, which provides IBM compatibility for the Amiga. Sidecar features a 5.25in. floppy drive and has three IBM-compatible slots available for expansion cards. The U.S. price of Sidecar is \$700. There is no U.K. release date available at present.

Commodore has also announced the availability of the 128D, a new version of the CP/M-compatible Commodore 64 upgrade fitted with an integral disc drive. The 128D is available in three configurations. The stand-alone version is priced at £499, which rises to £599 with a monochrome monitor.

Further details from Commodore Business Machines (U.K.), 1 Hunters Road, Weldon, Corby, Northamptonshire NN17 1QX. Telephone: (0535) 205555.

## Qwertyphone terminal

BRITISH TELECOM has developed a new desk-top terminal which features a full typewriter keyboard, a 32-column by four-line LCD screen and a built-in modem. The Qwertyphone is also capable of sending short memos, and can store up to 250 dialling codes.

The Qwertyphone bears a strong marketing relationship to BT's earlier Tonto — also known as the ICL OPD. It is intended to become the ultimate intelligent modem. British Telecom hopes to launch the machine in the autumn, priced at about £400. In the meantime it

intends to offer the Qwertyphone to OEMs for use as a system component.

Details from Victor Brand, Brand and Farmer Advertising, Beaumont House, 177 Arthur Road, Wimbledon Park, London, SW19 8AE.



## Minolta WP system

MINOLTA, the Japanese giant best known for its cameras and photocopiers, has a combined word processor, typewriter and computer intended for secretaries. The system, called the PCW-1, comprises keyboard, twin 360K 5.25in. floppies, printer and computer.

Costing £3,495, the PCW-1 is bundled with MS-DOS and Minolta's proprietary word-processing software. Further details are available from the Office Automation Division, Minolta U.K. Ltd, 1-3 Tanners Drive, Blakelands, Milton Keynes, MK14 5BU. Telephone: (0908) 615141.

## Hard disc goes on a short card

IN THE current craze for producing hard-disc cards, many manufacturers have overlooked the fact that many PC clones do not have a long slot to insert the cards in. However, Quibie has remembered the Epson PC and Tandy 1000 owners, and has produced a 20Mbyte hard disc on a short slot card.

The drawback is that the Quibie Hardpack is fatter than normal and the overhang tends to obscure the next slot. Quibie says that the problem is resolved by fitting the Hardpack into the slot next to the power supply and moving the floppy-disc controller, which normally resides in that position, to the next slot. The Hardpack is priced at £695. Details from Quibie, 7 Ferrier Street, London SW18 1SN. Telephone: 01-871 2855.

## Xen CD drops price and speed

APRICOT has announced a new model, the Xen CD, to add to the current range. It is a downgraded version of the Xen HD hard-disc system, with a 6MHz clock speed instead of 8MHz, and is priced at £2,599.

Based around the 80286 processor, the Xen CD is fitted with a 20Mbyte hard disc and 512K of RAM, which like the rest of the Xen range is upgradable to a full 5Mbyte on the motherboard. Apricot has chosen to launch this version of the machine because of market demand for 286 processing power coupled with hard-disc storage. Evidence of this is shown by the fact that sales of hard-disc Xens are outselling the floppy-disc version by five to one.

Apricot says that many users do not require the high performance of the 8MHz version and so have produced the CD model to pass on the savings allowed by using cheaper components. For further information contact Apricot Computers plc, Apricot House, 17 Westbourne Road, Edgbaston, Birmingham B15 3TR. Telephone: 021-454 9091.

## Tall Tree climbs on board

THE JRAM-AT3 is an extended memory board which conforms to the Lotus/Intel/Microsoft standard. A single board can contain up to 2Mbyte of memory, and up to eight boards can fit into a single system.

The JRAM-AT3 is manufactured by Tall Tree Systems and distributed by RCS Computer Services. Example prices are £530 for a 0K board, £590 for 256K and £1,010 for the full 2Mbyte. Details can be obtained from RCS Computer Services, Enterprise House, Central Way, North Feltham Trading Estate, Feltham, Middlesex TW14 0RW. Telephone: 01-844 2044.



# APPLE UPGRADES BASE MAC

APPLE has announced that the entry-level version of the Macintosh will now be supplied with the Mac Plus double-sided 800K internal disc drive and Mac Plus ROMs as standard. The New Macintosh 512K/800 is priced at £1,895.

Apple is planning to establish the new configuration as standard throughout the user base in order to encourage software houses to produce software which takes advantage of the format. The company has therefore announced that current owners can upgrade to the 512K/800 by purchasing the Macintosh Plus disc-drive kit. The upgrade costs £220 and can be installed by any Apple dealer. Apple

U.K. has no kits available yet and is waiting for the next shipment to arrive from the U.S. However, it is taking orders for the kits now.

Macintosh owners who want yet more features can purchase the Macintosh Plus logic board kit. Costing £550 to upgrade from a 128K Mac and £450 for a 512K system, the kit will supply 1Mbyte of memory, with the future option of 4Mbyte. The kit, which requires dealer installation, includes the provision of an SCSI port.

Further details from Apple Computer (U.K.), Eastman Way, Hemel Hempstead, Hertfordshire, HP2 7HQ. Telephone: (0277) 228888.



## Compaq responds

FOLLOWING last month's price reductions by IBM across its range of micros, a number of clone manufacturers have reduced their prices. The biggest flurry of activity has been from Compaq, which has reduced the price of the Compaq Plus and most of the 286 range by between 10 percent and 18.5 percent. The new price for the Compaq Plus is £2,495 while the 30Mbyte version of the 286 is priced at £4,395.

Compaq has also introduced several new models into its range. The Compaq Portable II Model 4 is based around the 80286 processor and features a 20Mbyte half-height hard disc, a third-height 360K floppy-disc drive and 640K of RAM as standard. The Portable II Model 4 is priced at £4,195. The Compaq Deskpro Model 3 is now fitted with a 20Mbyte half-height

hard disc and a full 640K of RAM, although the new version of the Model 3 costs £2,595 — 13 percent less than the previous version. The Deskpro Model 4 is the same configuration as the Model 3 but with a 10Mbyte tape backup facility and is priced at £3,245. Additional information can be obtained from Compaq Computer Ltd, Ambassador House, Paradise Road, Richmond, Surrey TW9 1SQ. Telephone: 01-940 8860.

Even more severe price reductions have been made by NEC. The company's APC-H1042 system has been reduced to £1,145 from £1,499, while the APC-H1142 now costs £1,645 from £2,399 and the APC-H1242E 20Mbyte model now costs £1,945. NEC Business Systems is at 35 Oval Road, London NW1 7EA. Telephone: 01-267 1645.

## HARDWARE SHORTS

- P&P Micros is distributing the Vega graphics board for the IBM PC. It can emulate IBM colour and mono boards as well as the Hercules format. Details on (0706) 217744.

- Sord Computer Systems has introduced the M-680UX. Intended as a Unix engine, the micro is available with either a 68010 or a 68020 CPU. Prices start at £3,990. Ring 01-631 0787.

- A new Macintosh network interface is available from Corvus Systems. The Omninet Network Interface is compatible with both the Mac and the Mac Plus, and is intended for use with Corvus's own networking system. Ring (010 41 22) 327289.

- System Bridge is a device which Logical Choice claims will allow data to be transferred between micros with incompatible operating systems. It is priced from £2,285. Details on (0865) 727946.

- Maxtech Systems has launched the TP-115 video printer, which can dump screen images direct from the monitor on to paper with no interface. The TP-115 has a resolution of 11.8 dots per mm. Details on 01-427 7764.

- Future Sales has introduced a new version of its FX-30 range with a 120Mbyte hard disc. The new model runs under Concurrent DOS 4.1. Details on (0323) 897469.

## Token ring network

LANRING, a token ring network clone, is now available from the London Computer Centre. It is claimed to be the cheapest token ring system you can buy in the U.K.

The network runs under MS-DOS 3.1 and 3.2 and can support up to 250 users. The London Computer Centre claims compatibility with IBM's token ring and broadband hardware. Lanring consists of a Lanboard priced at £395, an eight-station Starbox costing £195, and Repeater costing £65.

Details from London Computer Centre Ltd, 43 Grafton Way, London W1P 5LA. Telephone: 01-387 4455.



## Email directory

AT LONG LAST Telecom Gold is producing an on-line directory of subscribers. You access it by typing GOLD.USERS

at the > prompt.

New users are being added automatically. Anyone else who wishes to be listed should contact Claudia on 80:BTG014 with details of company name, mailbox number, name and any comments you would like in Gold.Users. In the near future an on-line form will be made available for people who wish to be included.

## Forecasting for business

SMART FORECASTS II is a statistical forecasting package aimed at business users. It allows you to analyse historical data using time series and regression techniques, then add your own more intuitive assessments. The £714 package runs on the IBM PC and close compatibles, making use of colour graphics to display results.

Contact P&P Micro Distributors, Carrs Industrial Estate, Haslingden, Rossendale, Lancashire BB4 5HU. Telephone: (0706) 217744.

## Spreadsheet checker

SPREADSHEET AUDITOR lets you check spreadsheet models for incorrect formulae, circular references and other kinds of errors. The £125 utility runs on the IBM PC and will help you check models created with Lotus 1-2-3, Symphony or Supercalc 3. You can display or print formulae, macros and cell cross references across either the whole spreadsheet or a specified range.

For details contact Tekware, Palladium House, 139-141 Worcester Road, Hagley, West Midlands DY9 0NG. Telephone: (0562) 882125.



# BORLAND'S TURBO PROLOG

BORLAND, the company that turned the dull Pascal programming language into a runaway success on the IBM PC, may be about to do the same with Prolog. Turbo Prolog, Borland's version of the cult AI language, is going on sale immediately for the IBM PC and clones at a price of £99.95.

Until now, interest in Prolog has been largely confined to academia and the AI research departments of large companies. Prolog is a declarative rather than a procedural language, which means that programming consists of giving the system information about the problem in hand rather than specifying exactly what it has to do to solve it.

Until now most Prolog compilers have been expensive. But Turbo Prolog is probably cheap enough for people to buy simply out of curiosity. It comes with a

200-page manual and an example system to get you started.

The compiler itself is very fast, compiling a claimed 2,500 lines of code per minute on a standard IBM PC. Program development takes place in a multi-window display complete with debugging aids, pull-down menus and other user-friendly paraphernalia. While Turbo Prolog has extensions to support IBM graphics and sound, Borland's distributor claims that it is a superset of the accepted Edinburgh dialect of the language as defined by Clocksin and Mellish.

Contact Altor Computers, Unit 11A, Anderston Centre, Glasgow G2 7PH. Telephone: 041-226 4211. Or Softsel Computer Products, Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866.

## Cheaper versions of dBase emerge

FOLLOWING the current resurgence of interest in CP/M-80 software, Ashton-Tate has relaunched dBase II at a special low price aimed at serious home and small-business users. dBase II is being priced at £119 including VAT and is distributed exclusively through First Software, based near Reading. This compares with a previous price of around £300.

Versions of the program are being produced for the Commodore 128, Amstrad, Tatung and Atari ST computers. Each of the versions is a full implementation of the program and comes with the complete Ashton-Tate manual.

Further details from First Software, Unit 20b, Fortune Park,

Fortune Road, Pangbourne, Berkshire RG8 7SW. Telephone: (07357) 5244.

A £99 clone of dBase III is the latest program in Adam Osborne's paperback software series. Called VP Info, it runs on the IBM PC and compatibles.

VP Info has a dBase-like command language and is supposed to be compatible with data files written by both dBase II and III. Unlike dBase, VP Info includes a built-in compiler, so once you have finished developing an application you can compile it to make it run faster.

Contact Newstar Software, 200 North Service Road, Brentwood, Essex CM14 4SG. Telephone: (0277) 220573.

## Memory-resident help

THE FASHION for memory-resident programs is now extending to providing on-screen help facilities. Two new memory-resident packages offer user assistance for specific applications.

DOS-Helper, distributed by Carrera Computing, provides on-screen assistance for MS-DOS versions 2.0 to 3.1. The program is priced at £39.95, with the disc containing two versions, standard and co-resident. For further

information contact Carrera Computing, 12 Lyons Avenue, Hetton-le-Hole, Tyne and Wear DH5 0HS. Telephone: (0783) 267816.

Zap is designed to provide on-screen help within the popular Pegasus accounts package: pressing Alt and f1 provides context-sensitive help. Zap is priced at £69. Details from Zorland, 144 Griffin Road, London SE18 7QA. Telephone: 01-317 7240.

## SOFTWARE SHORTS

● What's Best, the 1-2-3 add-on reviewed in our May issue, is available in the U.K. from 4-5-6 World. The price is £571 for the 256K version and £817 for the 640K version. More on (0473) 225951.

● Macauthor has finally arrived. This £199 Macintosh word processor is designed to provide maximum control over the format of your output. It is available from P&P on (0706) 217744.

● Boxes and Arrows, reviewed last month, now costs \$145 and is not copy protected. Details from (U.S. area code 213) 822-2800.

● Mac Cadd is a set of software design tools which runs on the Macintosh. A licence costs a hefty £1,200. More information from Logica on 01-637 9111.

● Priced at a mere £30, Jotter has to the cheapest commercial word-processing package for the IBM PC. Though devoid of the frills found in more expensive packages, the program seems to have all the features you would normally expect from a word processor. Details on (0423) 62055.

● APL Plus Spreadsheet Manager is a package from Cocking & Drury designed to analyse APL data. The program costs £195 and runs under the company's APL Plus PC system. Details on 01-493 6172.

● Microsoft has reduced the price of Rbase to £495 for a limited period. The offer runs from 7 June to 31 August. Users who return the registration card will receive a free backup copy of the program. Microsoft is on (0734) 500741.

● Torus Systems has introduced the Torus Disk Caching Program to increase the efficiency of its network. The program automatically caches up to 8Mbyte of information. Details on (0223) 862131.

● The Norton Commander is a disc-management system available from P&P Micros. The program is supplied with pop-up menus for ease of use, and can perform a wide range of disc operations. Contact P&P on (0706) 217744.





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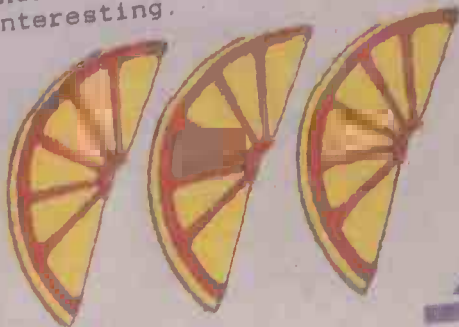
There you go. How about a palmy beach?



How do we do it?

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It makes things stand out

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JPC 1



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- ArcNet/DR-Net used
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Concurrent DOS 4.1 and CP/M-86 are trade marks of Digital Research.  
MS-DOS is a trade mark of MICROSOFT.

# BROMCOM

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## Hackers found guilty

HACKERS Robert Schifreen and Steve Gold were convicted at Southwark Crown Court on 25 April under the 1981 Counterfeiting Act. They were ordered to pay fines of £600 and £750 respectively, and costs estimated at around £1,000.

Schifreen and Gold were convicted after admitting that they had entered Prestel by using a test number which they had discovered accidentally. This gave them access to all the mailboxes on Prestel, enabling them to read any confidential information stored there. Both defendants intend to appeal.

*Practical Computing* will discuss the implications of the conviction in next month's issue.



Steve Gold.

## Compaq's top 500 rating

COMPAQ Computer Corporation, the manufacturer of IBM-compatible machines, has now shipped over half a million computers from its manufacturing plant in Houston, Texas. This kind of production has made the company a lot of money and has propelled it into the covered Fortune 500 listing.

Compaq's position, at 463 in the listing, is a record achievement for a company that has only been in existence for four years. In 1985 the company's net profit was \$26.6 million from sales of \$503.9 million. This compares with figures of \$12.9 million and \$329 million in 1984.

More information is available from Compaq Computer Ltd, Ambassador House, Paradise Road, Richmond, Surrey TW9 1SQ. Telephone: 01-940 8860.

# APRICOT PULLS OUT OF U.S.

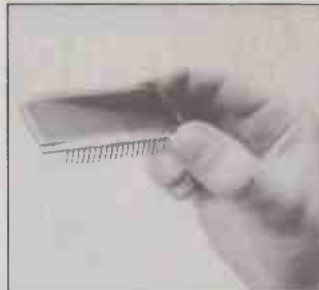
APRICOT Computers plc is expected to pull out of the U.S., where its subsidiary suffered an estimated loss of around £14 million for the year ending December 1985. The U.S. subsidiary, Apricot Inc., will be sold to its management for a nominal sum. Although Apricot Inc., will continue in business in the U.S., the company will lose its exclusive rights to distribute Apricot Computers' products.

The withdrawal from the U.S. ends an expensive and damaging chapter in Apricot's history. Once again, the lucrative and tempting North American market has proved barren for a U.K. computer manufacturer. For further details contact Apricot Computers plc, Apricot House, 17 Westbourne Road, Edgbaston, Birmingham B15 3TR. Telephone: 021-454 9091.

## Epson LCD chips

EPSON has developed a new LCD unit which overcomes many of the deficiencies traditionally associated with liquid crystal displays. The company claims that the new design allows the display to be read from any angle, from a distance and in a range of lighting conditions. Epson says that this makes the unit ideal for use in public-information displays like timetable information boards.

The secret of the display is Epson's black-shutter technology, which has already met with a degree of success. For further



details contact Epson (U.K.) Ltd, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892.

## World Reporter and Yellow Pages go on to Telecom Gold

TELECOM GOLD is providing a worldwide information service for its subscribers in the form of the World Reporter database. It contains information supplied by a number of respected sources such as Associated Press, the BBC, the *Financial Times* and *Washington Post*.

World Reporter is accessed by typing WR within Telecom Gold. Users can select which of the various sources they wish to access and can search the information via headlines, context or keywords.

The cost of World Reporter is £1.15 per minute. This does not include the normal Telecom Gold charges for connection. Subscribers can order a free World Reporter prompt card from Telecom Gold. Further information on World Reporter can be obtained by typing

INFO WR INTRO

Another new service provided

with Telecom Gold is Electronics Post. This is a subscription-only service provided by Datapress Publishing and is intended to help electronics engineers keep pace with new products. The service costs £500 per year. Subscription details are available from Datapress Publishing, 5-6 Edmonds Chambers South, Marlowes, Hemel Hempstead, Hertfordshire HP1 1BP. Telephone: (0442) 60658.

British Telecom intends to provide the Yellow Pages service in electronic format. The Electronic Yellow Pages system is planned for launch in January 1987 and will be accessible via 1,200/75 baud 1,200/1,200 baud and 300/300 baud formats and via Prestel. The service will be provided free of charge. Details from British Telecom, British Telecom Centre, 81 Newgate Street, London EC1A 7AJ. Telephone: 01-726 4444.

## SHORTS

● Plans to computerise Britain's Post Offices have been revealed. The £100 million project will begin in the spring of 1988 with 250 Post Offices in the home counties, and will expand to cover 6,000 offices over the next few years. The services provided will include automatic cash dispensers and computerised bills payment.

● IBM has announced that an experimental system running on a PC/AT has successfully created documents in response to spoken commands. Scientists at IBM's Thomas J Watson Research Centre claim that the system can transcribe sentences from a 5,000-word vocabulary with 95 percent accuracy. Details on (0705) 694941.

● Romtec's latest survey of the micro industry, *The Major Organisation Study*, reveals that 99,000 computers were bought by large corporations in 1985, which is more than all previous years combined, with IBM taking a 77 percent share of the market. The 200-page report can be obtained from Romtec on (0628) 74242.

● The Office of Data Protection has issued a second booklet on the Data Protection Act called *Questions and Answers on the Act (21-34)*, which answers 14 commonly asked questions about the Act. A free copy can be obtained from (0625) 535777.

## Lotus consultants

LOTUS Development has announced the first five of some 50 firms to be appointed as authorised consultants for the company. Those named are: Independent Computer Solutions on 01-734 2813, Spinney Systems on 01-638 6212, 4-5-6 World on (0473) 225951, Custom Micro-electronics on (0767) 316662 and Dr S P Bone on (0602) 817707.

The consultants will specialise in providing support for the large amount of bolt-on software proliferating for Lotus products. For details contact Lotus Development (U.K.) Ltd, Consort House, Victoria Street, Windsor, Berkshire SL4 1EX. Telephone: (0753) 840281.

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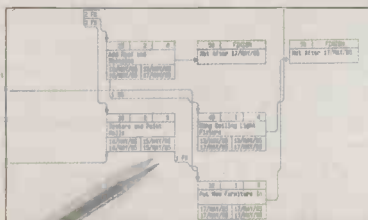
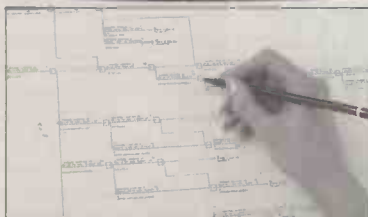
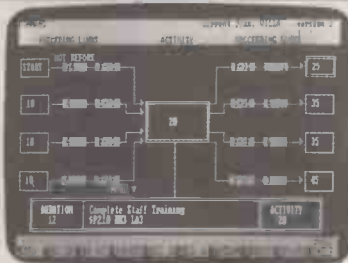
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BY MIKE LEWIS

## TOOLS FOR THE JOB

Programmers' tool boxes can often be a valuable source of useful subroutines.

acters to the comms port, as well as high-level routines, with a full implementation of the Xmodem protocol. It can be used with Microsoft's Pascal or C. Greenleaf also has a comms library with C source code.

Whatever your application, buying someone else's subroutines can create difficulties. Apart from the obvious problems of language compatibility, you have to be sure that the routines will work with your target hardware and operating system. Many of the libraries mentioned here contain code that is specific to the IBM PC. If you have the source you can at least program around such difficulties.

### LARGE INVESTMENT

Another important factor is price. The larger multi-function toolboxes, like Greenleaf and Smorgasbord, cost between £150 and £200, and more specialised products often cost much more. Given the savings in programming time, this sort of money is often easy to justify, but it could still add up to quite a large investment.

If the cost worries you, check with your user group or bulletin board as there are many useful libraries in the public domain. The CP/M Users Group is certainly worth the modest membership fee. In the IBM world, try Compulink. The trouble with both groups is that you can spend a lot of time searching through their vast catalogues for the software you need.

Although most function libraries are produced by small firms working in a limited market, there is at least one software giant that is making real money from this type of product, Borland International.

(continued on next page)

## TURBO DATABASE

program wordlist;  
(Counts the unique words in a body of text (such as a text file) and, optionally, prints the words in alphabetical order.)

The purpose of the program is to show the use of the Turbo Database Toolbox. The program should be compiled with Turbo Pascal ver. 2.0 or later, and run under CP/M-80, CP/M-86 or MsDos.

You will need your own routines for initialising the text stream (e.g. opening a text file), getting the next word, and closing the stream.)

```
const
  MaxDataRecSize=1;           {dummy value, needed by Toolbox}
  WordLen=14;                 {max. length of a word}
  MaxKeyLen=WordLen;         {length of a key in the index}
  PageSize=24;                { These constants are used by }
  Order=12;                   { the Toolbox; they can be }
  PageStackSize=8;           { adjusted to improve running }
  MaxHeight=5;               { time or save memory. }
  IFileSpec='TEMP.$$$';      {name of temporary index file}
  unique=0;                   {flag to say duplicate keys not allowed}

{include the needed Toolbox source code}
($I ACCESS.BOX)               {main Toolbox routines}
($I GETKEY.BOX)               {routines for searching index}
($I ADDKEY.BOX)               {routines for adding to the index}

type
  word=string[WordLen];

var
  ThisWord: word;             {current word from text stream}
  count: integer;            {running word count}
  index: IndexFile;          {the file used to hold the index;
                             the type IndexFile is defined within
                             the Toolbox}
```

(listing continued on next page)

There is one small part of the software market which seems to be growing even faster than the industry at large, but which has so far escaped the attention of the big names in the micro world. They are programmers' tool boxes, those libraries of reusable subroutines which are sold to software writers to help them cut down coding and speed up program development.

If you look through the back pages of any American computer magazine you will see scores of small advertisements for subroutines and function libraries for every popular language and application. They are usually the products of tiny software houses or private individuals who having developed a set of modules for their own use are trying to market their code to a wider audience.

Inevitably, the quality of these function libraries varies, but there are some exceptionally good ones. In the U.K. many of them are available through Grey Matter Ltd and the Core Store. Between them, these two firms supply around 100 libraries comprising thousands of separate modules.

Some languages are better catered for than others. Programmers who use C have the best

selection, mainly because C lends itself to the building-block approach. Pascal is another good choice. Because of its dependence on line numbers and global variables Basic is not so amenable to the idea of reusable modules. However, a good many libraries come in relocatable object form, which means that they can be interfaced with a number of different languages.

### GREENLEAF LIBRARY

One of the largest C tool boxes is the Greenleaf library. It is a treasure house of functions, covering everything from manipulating words of text to sector-level disc I/O. The C-Food Smorgasbord is another heavyweight, with an excellent set of BCD arithmetic functions. The Prolibrary includes routines for handling MS-DOS paths and for driving the Microsoft mouse, while Essential Software's library is strong on keyboard and screen support.

Many libraries are geared to specific applications, the most popular of which is file management. Softcraft's Btrieve has a comprehensive set of routines for file indexing and searching, callable from several versions of

Basic, Pascal, Cobol and C. Softfocus is one of many libraries of B-tree modules, while V-File contains C source code for disc buffering and caching.

For more serious database work, there is dBVista, which has its own data-definition language and which supports network databases. Programmers who use dBase II should take a look at the Computer Innovations library: it contains around 100 C source functions for manipulating dBase files and indexes.

Graphics is another popular area for tool boxes. There is a good choice of products for familiar tasks such as drawing pie charts and histograms, as well as handling the lower-level graphics functions. Three which are worth considering are Halo, Scientific Endeavours and GSS. An increasing number of libraries include window-management routines, allowing you to build Mac-like displays, in varying degrees, in your programs.

If you are developing a communications package, you should take a look at Asynch Manager. It includes all the primitives you are likely to need, including such functions as reading and writing single char-

(continued from previous page)

Its range of Turbo tool boxes is selling in large numbers to some of the half a million people who have bought its Turbo Pascal compiler.

There are now five Turbo libraries, each of which is excellent value. The first was the Database Toolbox, which consists of a collection of routines for sorting and indexing. This has now been joined by libraries orientated towards graphics, word processing and games. The latest offering is designed to help you write programs which interface with Turbo Lightning's on-line reference books.

### TURBO EDITOR


All the Borland products come with a well-documented Pascal source and include sample programs that show how to use the low-level routines. The Turbo Editor Toolbox is packaged with two fully functioning word processors for you to use or modify, or you can extract the procedures you need to serve as building blocks for your own WP program.

To get the flavour of the Turbo tool boxes I wrote a small program to count and list alphabetically the unique words in a body of text. This might not be a particularly useful job in itself but it could

form the basis of a more ambitious application, such as a text-compression routine or a programme cross-referencing utility.

You might think that this sort of program can simply store each word in a table, after first checking to see if it is already there, but this will not do. Towards the end of the text, each new word would have to be compared with every word that came before, so the program would take a very long time to run. In addition, the table would have to be sorted prior to printing.

A better way is to use a tree structure to hold an index to the words. It turns out that the indexing routines in the Turbo Database Toolbox are ideally suited to this task. Although they were designed to work with data files it is possible to ignore this aspect of their operation and to use them simply as a way of keeping an ordered list of keys.

The program is shown in the listing. I have omitted the routines that extract the words from the text, since these are not relevant to the indexing operation. For copyright reasons we cannot print listings of the tool-box procedures, so if you want to run this program you will have to buy either the Borland product or another suitable function library. 

### TURBO DATABASE

(listing continued from previous page)

```

reply: char;           (character typed by the user)
dummy: integer;       (dummy parameter for use where Toolbox
                       is expecting a data record number)
EndFlag: boolean;     (indicates the end of the text stream)

      (put your opentext, getword and closetext routines here)

begin (main program)
opentext;              (initialise the text stream)
InitIndex;             (initialise the Toolbox index system)
MakeIndex(index,IFileSpec,MaxKeyLen,unique);
                       (create the temporary index file)
count:=0;              (initialise the running count)
writeln('Counting in progress');

getword;               (get first word of text; store it in
                       ThisWord; set EndFlag at end of text)

while not EndFlag do
begin
  addkey(index,dummy,ThisWord); (try to add word to index)
  if ok then count:=count+1;    (count it if it was added ok)
  getword;                       (get next word)
  end;                             (and so on until end of text)

writeln(count,' unique words'); (report the number of words)
writeln('Do you want a list of the words?');
read(kbd,reply);
if upcase(reply)='Y' then
begin
  clearkey(index);             (set Toolbox's pointer to first entry
                               in index (i.e. first word))

  while ok do
  begin
    nextkey(index,dummy,ThisWord); (get next index entry)
    if ok then writeln(ThisWord); (print it)
    ok is set false by Toolbox when no
    further index entries available)
  end;

end;

closetext;              (close the text stream if necessary)
closeindex(index);     (close the temporary file)

end. (main program)

```

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Excellent 350 page tutorial and reference manual. Totally automated menu-driven, syntax-checking Source Code Editor which even tells on which page in the manual to get help. Create pull down menus and 10 overlapping windows. Up to 128 colour combinations. All IBM business graphics supported. Set video highlight/normal/reverse. Powerful scroll and wrap commands. User definable printer control characters. Full Function Key access and control. Not Copy Protected. So... at £69.00 it's a must.

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# Hilderbay

## Professional Software

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The versatile and efficient qualities of **Hilderbay Payroll** make the complicated and tedious task of preparing wages and salaries that great deal easier.

This invaluable tool is a must for every business and takes care of all Payroll calculations and record-keeping for the smaller to medium size business. **Payroll** will handle all levels of pay, tax codes (including NT: No Tax) and National Insurance at standard, reduced, over pension age, or nil rates, contracted out or not. **Payroll** works with batches of 50 employees at a time and is being successfully used by companies of over 100 employees as well as even larger organisations (Government and private) for confidential processing. Only information which has changed since the last Payroll need be entered — employee, tax and National Insurance details are stored. The Inland Revenue specifications are followed accurately; no error of calculation has ever been reported since the first **Payroll** was tested in 1980.

Users from all walks of life have found **Payroll** very easy to use with very little knowledge of computing or methods of payroll calculation for successful operation.

In addition to comprehensive reporting facilities (End of Year etc.), **Payroll** will compute gross pay and deductions for a given net pay.

An additional module to enhance the Version 6.00 has now been produced.

### HILDERBAY PAYROLL

The module consists of an additional program (postprocessor) and facilitates:

- a) the use of optional pre-printed payslips
- b) accumulation of Inland Revenue totals (until cleared)
- c) accumulation of all pay data to provide end of year totals
- d) printing of bank giro transfer slips
- e) revised coin analysis
- f) directors NI

### S.S.P. STATUTORY SICK PAY

**Hilderbay S.S.P.** is a free standing programme that will compute Statutory Sick Pay as required by law.

It will calculate SSP for all cases — even the ones of a most complex nature. There is no requirement to understand the linking of periods of incapacity for work, reasons for the exclusion from SSP etc.

All information required by law, and by the user, is printed out at the end of each calculation and only information that is actually required for the calculation need be entered: for example, it is not necessary to enter pay details of an employee earning more than £80 plus overtime per week, because the pay is obviously over the threshold of £65 per week.

**S.S.P.** is so easy to use that it is most suitable for training staff or even unusual cases such as in the case of a pregnant employee who has been in the service of the employer for a period less than 3 months and falls ill while in custody outside the EEC!

This is another of our products where no error has been detected since having been brought onto the microcomputer market.

### INVOICER

**Hilderbay Invoicer** is the essential support for the businessman or business (small or large) on the move today and is an absolute must which enables a quick and speedy processing of orders in the 1986 organisation.

Customer and product information — a standard disk will handle up to 2000 stock items and/or 1000 customers — are readily available for access to generate invoices on preprinted stationery or on plain white computer paper.

**Invoicer** will also hold customers and prices (stock lists) in memory of the computer, thus making the operation very fast and efficient.

Items and customers may also be entered via the keyboard during operation of the programme if these are not stored on disk files.

During operation, **Hilderbay Invoicer** will update information to the **Hilderbay Book-Keeper** (if available) and so generate accurate analysis of VAT and sales figures for management reports if the Book-Keeper is configured for the purpose of a Sales Ledger by the user.

**Hilderbay Invoicer** is a programme that will not become outdated in its function and can be easily set to function even on a hard disk unit.

### BOOK-KEEPER

Imagine purchasing a blank ledger from the shelf of a stationery supplier. You yourself have to decide on the function or purpose of that book.

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Due to its versatility, **Book-Keeper** will perform the functions of any of the standard ledgers used within accounting (cash book, purchase ledger, general ledger, petty cash and home accounts) to the highest of standards and faster than any manual method.

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Complete and comprehensive lists of debtors and creditors together with the already mentioned facilities make **Book-Keeper** an essential and valuable asset that no business person should be without.

**Book-Keeper** also integrates with **Hilderbay Invoicer** and is updated with information generated by the issue of invoices to customers.

This definitely unique programme is available for most microcomputers on the present day market and many users to date have confirmed that a programme of this type has been the solution to many of their difficulties.

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# Hilderbay

## Professional Software



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providing up to 1500 creditor accounts with full reporting facilities.
- GENERAL LEDGER & CASH BOOK**  
incorporating all facilities (1000 accounts) with management reports to Profit & Loss and Balance Sheet status.
- INVOICING & STOCK CONTROL**  
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<b>HILDERBAY INVOICER</b> (as above)	£119.00
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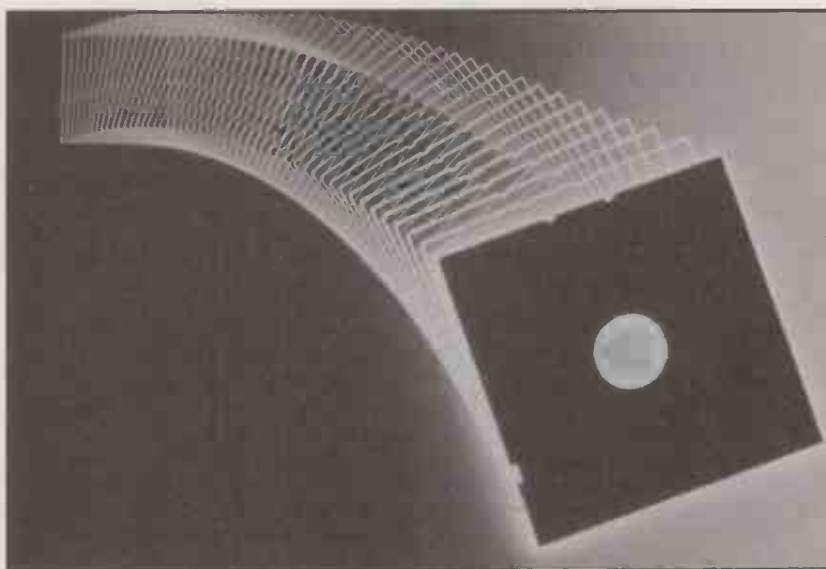
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BY RAY COLES

## ON THE BUSES

The flexibility of bus systems such as the SCSI make them an attractive means of linking processor and peripheral units to build up a tailor-made system.

It all started with the S-100 bus from MITS. The same company was the manufacturer of the first microprocessor-based personal computer, the Altair 8800. The S-100 bus introduced a simple route to system expansion by providing pre-wired parallel-connected backplane card slots into which any combination of memory and peripheral boards could be plugged to build the required system.

This was not a new idea, of course. Bigger machines like minicomputers and mainframes had relied on the concept of a common interconnection bus since the 1950s. But the S-100 bus brought big-system flexibility to low-budget microprocessor-based systems for the first time and the concept became an instant success. Despite its initial popularity, however, many personal computers have not adopted the bus approach. A major reason for this is that it is inherently more expensive to produce an open-ended design than to specify the final system in advance.

One of the most important features of any bus is the interface definition and how it is controlled. The allocation of pin connections is the obvious starting point, but interface protocols, logic levels and timing must also be specified and published so that new circuit boards from a variety of vendors can be designed to plug straight in.

A whole range of backplane bus standards have since been introduced for microprocessor-

based systems, and are widely used in so-called professional and industrial systems. Manufacturers offer large families of compatible circuit boards which can be plugged into any card rack with the appropriate backplane bus connections to build industrial controllers, computer-aided design work stations or special-purpose number crunchers. The custom systems which result can have the required combination of processors, memory and peripherals as decided by the end-users, not by the board manufacturers.

One of the first bus standards to be widely adopted was the Intel Multibus. It can be used with both eight-bit and 16-bit microprocessors and includes in its specification an arbitration scheme. This scheme allows multiple master and slave processors to gain access to other bus resources such as memory and peripherals without contention. Now available is Multibus II, which uses a different circuit-board format and extends operation into the 32-bit world of the 80386 and similar processors.

Also very popular is the VME bus, originally specified by Motorola to support its 68000 16-bit and 32-bit processors. It has been adopted by other suppliers, including National Semiconductor which uses it with the 16032 and 32032 chip families.

### ARBITRATION LOGIC

Buses such as Multibus and VME are in principle just extensions of the address, data, and control bus lines which emerge from the processor chips themselves. They have to be suitably buffered, and include some additional features such as the arbitration logic to allow more than one processor to share the system resources. To keep data throughput as high as possible the buses are essentially parallel in nature, but there are also other bus schemes which have been designed for quite a different purpose.

In low-cost consumer products such as television sets, which are now becoming increasingly cluttered with microprocessors and their associated digital control circuits, the speed advantages of costly parallel interconnections are often not needed. Taking advantage of this fact, Signetics has specified a two-wire serial communication link called the Inter Integrated Circuit bus, or I<sup>2</sup>C bus.

As the name implies, the aim of the I<sup>2</sup>C bus is to link together integrated circuits on the circuit board or boards with the

minimum number of interconnections. To reduce the interconnections to just two wires, each chip in the system has to have a special bus-interface controller integrated along with the circuitry providing the main function. But with the circuit densities available from today's chip technology this is not much of a burden, and it does bring some major advantages.

### ECONOMIES

Complex peripheral functions, which in conventional form need 24-pin or 40-pin packages to allow for address and data bus connections, now need far fewer. Often no more than eight pins are needed, making a considerable cost saving, despite the extra chip complexity. Printed-circuit boards also need fewer tracks, and inter-board connectors can have fewer pins. These are important economies in cost-sensitive consumer goods. Despite using only two wires, the I<sup>2</sup>C bus supports up to 128 separate peripheral chips and allows bi-directional communication of address and data information.

Disadvantages include a much lower data rate than is possible with conventional parallel interconnections, and the fact that all the chips used have to be specially designed to interface with the I<sup>2</sup>C bus. Fortunately Signetics now supplies a whole family of I<sup>2</sup>C devices that includes microprocessors, memories, display drivers, TV tuners, speech synthesisers, and a wide variety of special-purpose interface devices.

Another area where the specification of a standard interface bus can be an advantage is in the connection of bulk-storage devices such as disc and tape drives to small computer systems. Most personal computers use direct connections to such facilities, with the interface circuitry tightly coupled via the microprocessor bus. This is fine if there is no real need for system expansion apart from adding an additional drive or two of the same type. But for more complex requirements it is not really adequate.

It may be that you need to share bulk-storage devices between several computers. Or you might want the flexibility to add, say, an optical-disc drive or a streamer tape drive. This is only really practical at the user level if a general-purpose peripheral interface bus is provided. Such a provision is likely to become increasingly common in upmarket personal computers in the future, thanks to the launch of a number of complex peripheral chips


designed to implement the Small Computer Systems Interface bus standard (SCSI).

SCSI will make it very much easier to tailor the configuration of personal-computer systems to suit users' individual needs. Any personal computer with an SCSI bus connector can be expanded by the simple connection of up to eight complex peripherals such as Winchester discs, optical discs, streamer tapes and plotters. It can even share all these facilities when necessary with other computers connected to the SCSI bus.

Of course, all the peripherals chosen will have to be equipped with an SCSI interface, but most suppliers now offer variants of their peripherals with the appropriate circuitry already installed. Computers such as the IBM PC which do not currently have provision for SCSI can be upgraded by means of a plug-in SCSI host adaptor card. Other host adaptors for the VME bus and the Intel Multibus are also becoming available. The Apple Macintosh Plus has an SCSI interface fitted as standard, and the ICL DRS-300 multi-user system — reviewed on page 48 of this issue — uses an SCSI bus to connect its various modules.

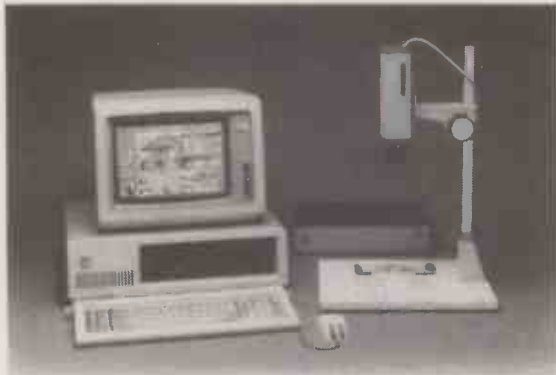
### OFF-LINE BACKUP

Devices connected to the bus can be designated as initiators or targets. A system with a single initiator and multiple targets implies a system with a single host computer which controls multiple peripherals. A system with multiple initiators implies that the peripheral resources are shared between several computers. Facilities such as off-line backup will also become possible with, say, the disc drive talking directly to the streamer tape drive over the SCSI bus without the participation of the host computer.

The complexity of the electronics for the host adaptor and the peripheral controller would have made the SCSI scheme prohibitively expensive a few years ago, but now a variety of manufacturers are introducing SCSI chip sets which take a lot of the hard work out of the interface design. The Ferranti ZN-1011Q device can be used at either end of the SCSI bus as initiator or target. It provides all the circuitry, including the high-current bus drivers, to interface between the microprocessor system lines and the SCSI connector. Western Digital offers the WD-33C93, which performs basically the same task. And NCR has the 5380, which has been around longest and appears in a range of systems. 

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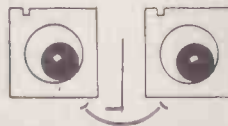
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BY BEN KNOX

## COMPULINK

There are ways of making money from a BBS.

**B**ulletin-board systems (BBSs) are the electronic equivalent of the local or community newspaper. For a modest outlay anyone can become the publisher of electronic information and run a messaging system.

But can a BBS be a money-making or at least break-even proposition? If you speak to the BBS purists, then almost certainly the answer will be "No, it's against the whole spirit of BBSs."

Assuming that you are not too worried about the feelings of the BBS purists — and it is you who is paying for all the equipment and time — then there are two ways to produce an income from a BBS. You can either use it for advertisements or charge users for registration and using the system.

### LOW REVENUE

Advertising revenue is likely to be low because the number of people who will see an advert on a BBS is very low in advertising terms. Charging users is a much more viable proposition if you can supply information or services which people will pay for.

Compulink is a charging BBS run by the Compulink user group for owners of IBM and IBM-compatible computers. The Compulink BBS runs on a multi-user system with six telephone lines. It is based on a Compaq 286, IBM PC/AT and two IBM PCs networked together. The modems in use are four Dataflexes, a Miracle Technology WS-3000 and a U.S. Robotics Courier.

The system runs under Fido, which does not provide any multi-user specific features such as user-to-user real-time chatting or multi-user games.

The BBS is made up of three areas: messaging, files and an Outside environment. The Fido BBS is notorious for having a rather

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Check your dialling code booklet.

Your FIRST name: Ben
Your LAST name: Knox
Ben Knox? [Y,n]:
Wait ...
Password: .....
You last called on 20 Apr 86 11:43:39

You are the 6,530th caller
You smash it - and I'll build around it.
JOHN LENNON

Wait ...

MAIN Commands:
M)sg-Section F)ile-Section G)oodbye
S)tatistics A)ns-Questionnaire B)ulletin
Y)ell C)hange U)ser-List E)ditorial
V)ersion O)utside
Main: M F G S A B Y C U E V O or ? for help:
    
```

unwieldy messaging system. Compulink provides a number of message areas including: a general section for miscellaneous messages; Dr. Solomon's Surgery, for any messages relating to computers, communications, hardware, software and so on; Fidonet area for messages to be transferred over the Fido network to BBSs in other parts of the U.K. or abroad; comments to and from Sysop, for private mail to and from the operator of the system. Lastly, each area has a facility for sending private mail to a particular user.

Compulink provides comprehensive uploading and downloading facilities. The system has some 120Mbyte to 140Mbyte of programs available for downloading. The programs it holds are predominantly public-domain software that can be copied and downloaded from BBSs without

copyright problems. If you download a program and find it useful, you are requested to send about £25 to the author of the program. Public-domain software is a good idea because you can see if a program is what you need before having to make any financial outlay. Also £25 is not very much money for a high-quality program — and public-domain programs are often better than packages which you would expect to pay several hundred pounds for.


### OUTSIDE

The Outside environment on Compulink provides — or will do when it works properly — users with access to facilities which are not normally available on the Fido BBS. Compulink will be providing some language compilers, a database-retrieval system linked to

its software library and the Common Ground conferencing system in the Outside environment.

Compulink says that it will be adding an optical-storage system in the near future to provide faster access to files for downloading. Eventually it plans to upgrade the BBS to a full-blown Unix system with links into the PSS data network.

Registration on the Compulink BBS costs £10. Joining the Compulink User Group costs £30 per year for which you receive full access to the BBS, regular circulars and a disc-based magazine every three months that provides details of new additions to the software library and upgrades to the BBS.

For further information contact Compulink User Group, 67 Woodbridge Road, Guildford, Surrey. 



A smiling waiter in a tuxedo is holding a silver tray. On the tray is a blue software box with the word 'Hotelier' on it, which is placed on a large salad platter. The background is a restaurant setting with framed pictures on the wall.

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**Q** I am an academic, and do my writing in three places: at home, in my departmental office and in the University library. I wish to invest in a word-processing system that will cover my overall situation. I have in mind the purchase of a lap-held micro such as the NEC PC-8201A, and a high-capacity word processor for the real writing. I hope to be able to transfer the notes to the main word processor for rewriting, editing, indexing, etc. I would be most grateful to know whether what I have in mind is possible.

A L LAKIN

**A** As you point out, you need two different machines. There is a wide choice of IBM PC and IBM PC/AT look-alikes for the desk-top machine, and because there are big sales there is competition and prices are keen. In contrast, the lap-held market is small and machines cost appreciably more than a desk-top micro with the same features.

A lap-held machine must obviously be small and light enough to carry easily. Further, it must be able to run from batteries so that you can use it where there is no mains plug. One price you pay is that the screen is often very small, so you need good eyesight and need to sit close to it. The screen often displays only a small number of lines and a small number of characters per line, sometimes eight lines of 25 or 40 characters, compared with the standard 25 lines of 80 characters on desk-top machines.

To minimise the power consumption the screen is usually a liquid crystal display (LCD). These are usually much less legible than the usual monitors, and you have to adjust both the viewing angle and the brightness to suit the brightness and direction of light in the room. LCD screens are sometimes impossible to read in certain lighting conditions, though those offering backlighting facilities are usually better.

The keyboard on some lap portables is smaller than normal, and unless you have small fingers it may be difficult to use. Some people will remember this was a problem years ago with the Pet computer. To save space, the number of extra keys for special functions or for moving the

# MANAGING HARD DISCS

**Q** Can you offer any advice on two problems concerned with a hard disc that I have recently fitted to an IBM PC. What is the quickest way of backing up a hard disc on to floppy discs? Also I have divided a 20Mbyte hard disc into a lot of sub-directories. I would like to know how to make the machine automatically search all of the sub-directories for a given file.

F STOKES

**A** It is in general a slow business backing up a hard disc on to floppies. The process is laborious and fiddly on a machine where the discs only hold 360K, since you will need about 60 floppy discs for a 20Mbyte hard disc. Consequently many people have turned to tape streamers rather than floppy discs. However, streamers are expensive at about £800. Using floppies for backup on an IBM PC/AT is not quite so bad, since the discs hold 1.2Mbyte each; you can back up the entire hard disc on 17 floppies.

PC-DOS or MS-DOS contain a command Backup which copies files from the hard disc to floppies. There are also a number of options that allow you to copy the entire disc, one sub-directory, files with a specified name or extension, or files which have been changed since the last backup. The backup floppies cannot be used in the usual way but must be copied back to a Winchester disc with the Restore command before the files can be read. This procedure can take several hours.

A new program called Fastback backs up files on to floppies very quickly. It is very easy to use and it includes error-correction facilities to recover data from damaged floppies. It is claimed that a 10Mbyte hard disc can be backed up on to 360K floppies on an IBM PC in under eight minutes, or on to 1.2Mbyte floppies on an IBM PC/AT in under four minutes. This is faster than using a tape streamer and much cheaper. The program costs £159 from Riva, 9 Woking Business Park, Woking, Surrey GU21 5JY. Telephone: (04862) 71001.

Normally the PC-DOS or MS-DOS operating system will look for a file in the particular director or sub-directory to which you are attached. It is easy to make the operating system look through a number of sub-directories to find a given file simply by using a Path command. This can be typed at any time as a DOS command but it is best to put it in an Autoexec.Bat file so it will be implemented automatically each time you switch the computer on.

The Path command defines the search path specifying which directories will be searched and in what order. When you begin to use the hard disc you will be in the root directory. Suppose that your hard disc is drive C and you use the Mkdir command to set up three sub-directories called Dos, Basic and Letters. If you would like the operating system to search first the sub-directory Dos and then the sub-directory Basic, but not the Letters sub-directory, you need the command

PATH C:\DOS; C:\BASIC

If you have partitioned your hard disc — say, into logical drives C and D — using the Fixdisk utility, then you can specify the logical drive as well as the sub-directory in the Path command

PATH C:\DOS; C:\BASIC; D:\LETTERS

**? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? · ! · ? · !**

cursor is limited, sometimes severely.

There are also problems with permanent storage of data. The cheaper machines have no disc drives, so any information typed in must either be stored on a cassette or the machine must be left switched on until the data has been transferred to the main computer.

The biggest problem is that you must have an easy way to transfer data from the lap-held portable to the desk-top machine. Having 5.25in. discs on both is by far the best solution, but also the most expensive. Failing this, the lap-held machine must have a program to transfer data via a serial port, down a wire and into the main machine. The

usefulness of a lap-held machine as a satellite to a main machine depends on the ability of this program to transfer data easily, reliably and quickly. I have seen several such programs which either did not work or were difficult to use, and I would strongly recommend that before you buy this class of lap-held machine you get the dealer to demonstrate the transfer to your main machine.

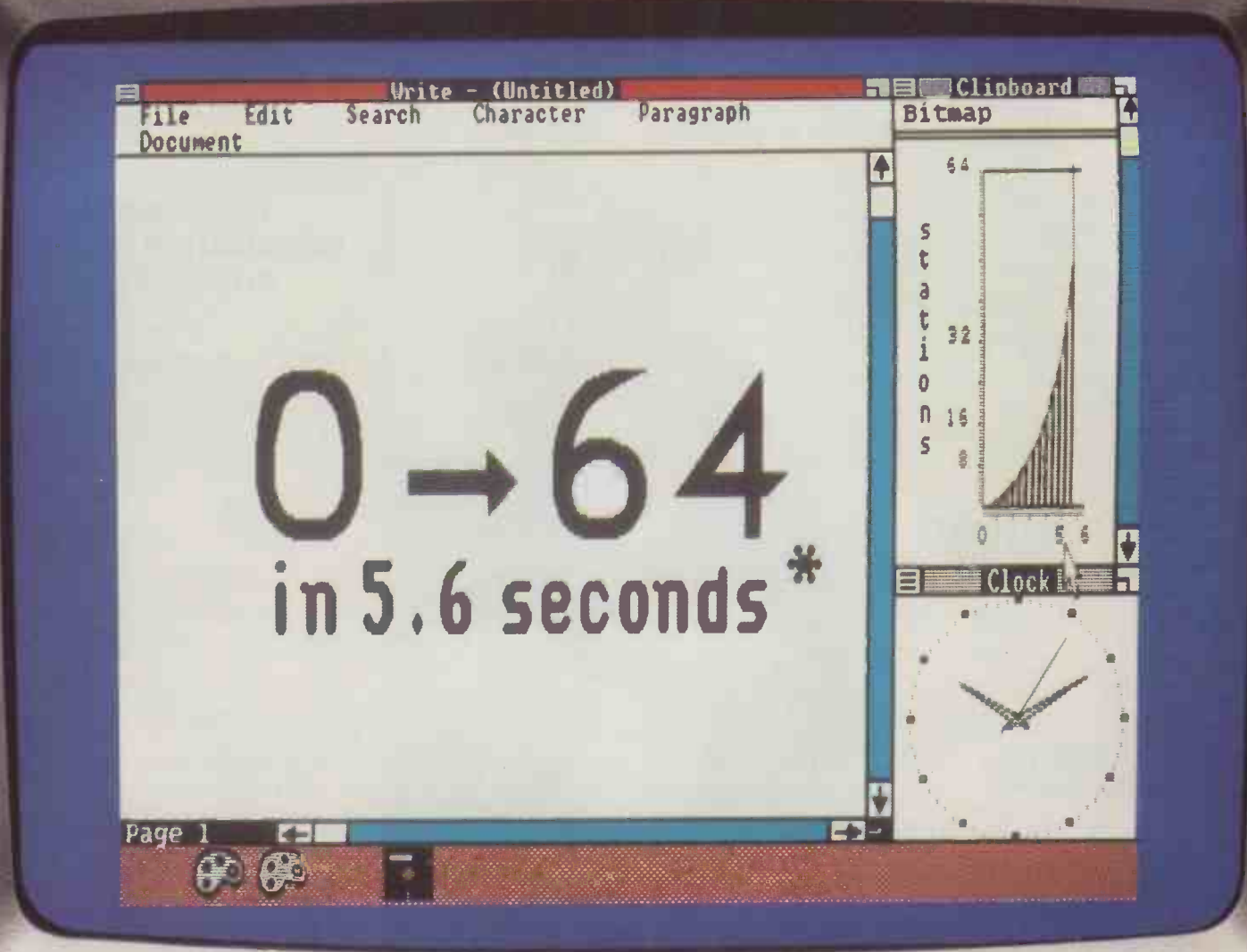
**Q** I have a query about the size of memory possible in my Sanyo. The machine has 128K of built-in RAM, plus another 128K which I have installed. I thus have enough memory to use 134K of RAM disc and can use WordStar without disc accesses and its attendant delays. The Sanyo circuitry includes decoding for the address lines A18 and A19. However, installing an extra bank of 64K RAM stops the Sanyo from booting. Using the same RAM chips within 256K overall works fine, so the chips are OK. As the DOS will handle 640K, where is the hitch?

P A DUVAL

**A** Our understanding is that there is no provision for adding extra memory other than that extending up to 256K on the motherboard; you cannot add extra memory boards. Furthermore, we do not know of any memory expansion by third-party suppliers that is approved by Sanyo.

It is true that MS-DOS can handle 640K, but machines that can have their memory expanded must be told how much memory is actually fitted. This is done in one of two ways. The IBM PC uses switches on the motherboard to set the amount of memory, while the Ferranti PC-860 detects how much contiguous memory exists by systematically writing to each byte and reading it back. Thus either hardware or software can be used.

We do not know if it is possible to add extra memory chips by piggybacking them with existing chips. You would need to be a competent electrical engineer and require considerable expertise to do this. Finally, you might consider it worth joining the Sanyo Users Association, 226 Quadrant Arcade, 80 Regent Street, London W1. There may be someone who has made it work.



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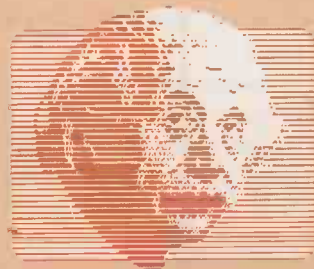
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THE FIZZ has definitely gone out of the computer book publishing market. A year ago there was hardly a publishing house that did not have one or even two paperbacks which had been hurriedly knocked together on the latest machine. But today even a runaway success like the IBM PC can barely stir a flicker of interest from a publisher. Now it is the established academic houses who are mainly servicing this market, which is probably as it should be.

The best book in the present batch about the IBM PC is published by Microsoft Press, which is fast gaining a reputation for top-quality if slightly pricey books. *The Peter Norton Programmer's Guide to the IBM PC* is by the author of the best-selling Norton Utilities, who is undoubtedly well qualified to write a book which aims to be the definitive reference guide to the IBM.

As you might expect, there is a lot of Interrupt 39, terminate-but-stay-resident, peek, poke and jump-table stuff, but the book contains far more than a happy hacker's paradise of addresses. It divides into two parts. The first seven chapters tell you a lot about how the PC works in general. For example, there are good sections on what disc formats really mean, why the keyboard is soft, and what all the video modes are.

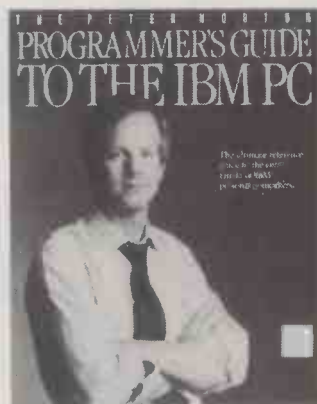
The next half-dozen chapters go over the same ground in greater depth, in particular giving all the gory details about how the BIOS ROM — which in many ways is the essence of the IBM PC — copes with all these aspects.

After dealing with the ROM, Norton goes on to tell you several hundred things you never knew about DOS, and indeed may not have wanted to know unless you are a programmer. The last section of the book picks up on the programming aspects, and gives tips on how to interface to the IBM, with more detailed information about using assembler, Basic, Pascal and C. After several appendices there is a commendably full index.

This book seems likely to achieve its aim of becoming the

# BLUE HORIZONS

Glyn Moody examines the latest guides to help you find your way round the workings of the IBM PC.



ultimate in IBM PC reference works. It even corrects the IBM technical manual on some points. It is very well organised, with neat markers in the text distinguishing between the PC and the AT. Its wise and perfectly faultless lecturing tone can become oppressive, but it is well worth the price and is indispensable for anyone who really wants to get inside their PC.

If you are looking for something more approachable, and which does not assume that you know a Lifo stack from a Fifo, *Discovering MS-DOS* by Kate O'Day may be suitable. It is an American publication which adopts an easy reading style, complete with cartoons and jokes. It assumes nothing, yet covers most aspects of MS-DOS very fully.

It begins with computer basics such as hardware, software, operating systems and MS-DOS. It explains them simply and effectively but does not dwell on them unduly as some beginner's books do. The heart of the book is a gradual introduction to the nitty-gritty of MS-DOS, done mostly by quoting examples and including many screen dumps.

Although not every MS-DOS command is covered and the index is a little skimpy, *Discovering MS-DOS* emerges as one of the better books of its type. If you want a gentle introduction to the workings of MS-DOS which does not patronise, you could do worse.

*MS/PC-DOS Prompt* is much more straightforward and lacks the studied mateyness of the American book. Unfortunately, it also lacks its depth of explanation. Rather strangely it begins with a section

called "DOS at a Glance", which uses a mixture of left-hand pages of text with right-hand pages of diagrams to provide a very clear and concise basic guide. This is followed by "DOS in Practice", which aims to give more practical hints on using DOS with a number of half-worked examples. Regrettably, the examples are typeset rather than screen dumps. Although this book is nothing special, it is relatively cheap.

*MS-DOS and PC-DOS, A Practical Guide* is hamstrung by the fact it is not typeset but instead uses a typescript as camera-ready copy. The effect is hard on the eyes, and a serious disincentive to reading and barrier to understanding.

The content itself is quite good. It begins with DOS 1.0 then goes off at a tangent to discuss Basic on the IBM PC. This is followed by a description of DOS version 2.0 and 2.1. There is a very good chapter on Edlin, which is followed by version 3.0. All-in-all it is a very idiosyncratic book, but it may meet your particular needs.

*PC-DOS, Fundamentals for Diskette-Based Operation* manages to shoot itself in the foot in the first few pages by announcing that it will ignore the hard-disc version of the PC entirely. Since an increasing number of machines now come with a Winchester, this is unnecessarily limiting.

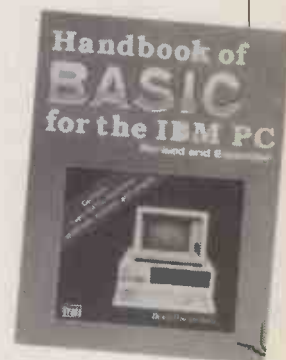
Its contents are fairly predictable, though at least the text is well written. One quirky section is a brief chapter on word processors, which seems out of place. A useful chapter covers material which is surprisingly rarely seen anywhere: how to run an existing program. For absolute beginners this can often be a problem. The books comes with a good index but is so off-beam as far as the beginner PC user is concerned that it cannot be recommended.

Another indication of the various fashions in computing and publishing is that only one book on Basic for the IBM PC has turned up over the last year; publishers rightly recognise that few people use their PCs to write programs in Basic. As a result, the *Handbook of Basic for the IBM* by David Schneider is something of an

## BOOK REVIEWS

oddy. Its structure is peculiar too. It combines elements of a reference book with those of a teaching book. It is organised alphabetically by keyword, but there are numerous examples for each entry. As well as various comments, the entry ends with suggested applications where the particular commands might be useful.

Although Schneider's book is hardly a tome to snuggle up with in bed, it is remarkably complete and adopts a very sensible approach. Its 570 or so pages are almost overkill, but anyone who wants to know about Basic and what it is for will find it fascinating. Pity about the price.



### BLUE HORIZONS

**The Peter Norton Programmer's Guide to Utilities** by Peter Norton. Published by Penguin, £16.95. ISBN 0 1408 7144 6

**Discovering MS-DOS** by Kate O'Day. Published by Pitman Publishing, £14.50. ISBN 0 672 22407 0

**MS/PC-DOS Prompt** by Randall McMullan. Published by Collins, £10.95. ISBN 0 00 383288 0

**MS-DOS and PC-DOS, A Practical Guide** by Pim Oets. Published by Macmillan, £8.95. ISBN 0 333 39569 7

**PC-DOS, Fundamentals for Diskette-based operation** by Peter Calingaert. Published by Prentice-Hall International, £19.10. ISBN 0 13 654906 3

**Handbook of Basic for the IBM PC** by David L Schneider. Published by Prentice-Hall International, £24.55. ISBN 0 89303 510 6



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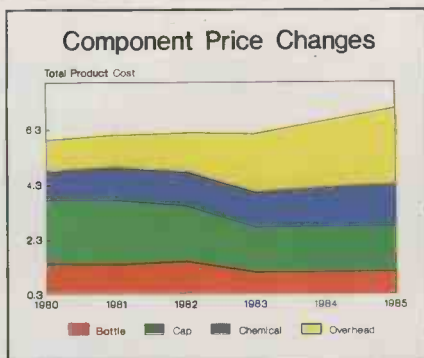
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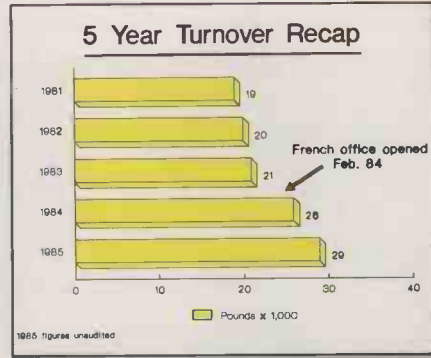
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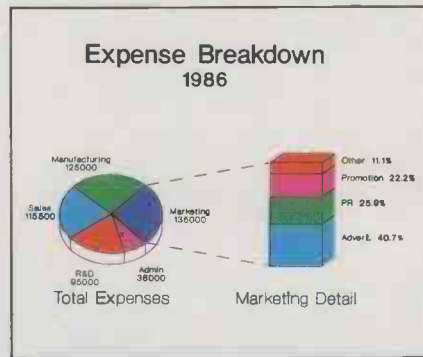
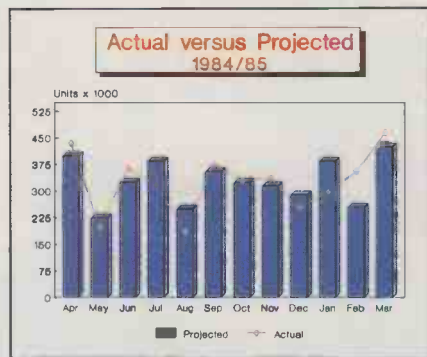
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(Example of 3 Column Table)

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opposite will reveal a particular PC designed  
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(Available 3rd Quarter 1986)

**Olivetti M24: The biggest selling PC compatible, available in three versions.** An unrivalled range of standard features: fast - 8086 processor running at 8MHz; 128K RAM expandable to 640K on motherboard, parallel and serial interfaces; monochrome/colour graphics including super-high resolution (600 x 400); space for two disk drives for 5 1/4" diskette or 10MB hard disk.



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# ICL DRS-300

## MULTI-USER BY STAGES

By Steve Malone

In its bid for the office-automation market of the next decade, ICL has gone for a modular system based on the 80286 processor and Concurrent DOS.

The appearance of the DRS-300 shows a radical departure from the normal concept of a microcomputer housed in a single box. Instead, each of the major systems which make up a microcomputer have been housed in separate modules. The advantage of modular design is that it enables users to expand the system as their own needs grow, or to mix and match the configuration to their own requirements.

There are at present seven modules available for the DRS-300. Each module is housed in a separate case about the size of a box file. The electronics are held inside metal casings, with the front and rear of the modules covered by plastic cowlings. Unclipping the covers reveals the interfaces. Data is transferred between the modules via a 40-way Small Computer Systems Interface (SCSI) port. Many of the modules in the range have twin SCSIs to allow daisy-chaining.

At the heart of every DRS-300 system is the A2 CPU module based around the Intel 80286 chip. The A2 is fitted with 1Mbyte of RAM as standard. Although it uses the same processor as the IBM PC/AT the DRS-300 is not in any sense an AT clone. Consequently it is not bound by the hardware restrictions of the IBM architecture, and is able to utilise the entire megabyte of memory. This is in contrast to the AT, which is restricted to 640K of directly addressable memory.



There is a choice of intelligent text-only terminals (above) or bit-mapped colour units (right) to run Gem software.

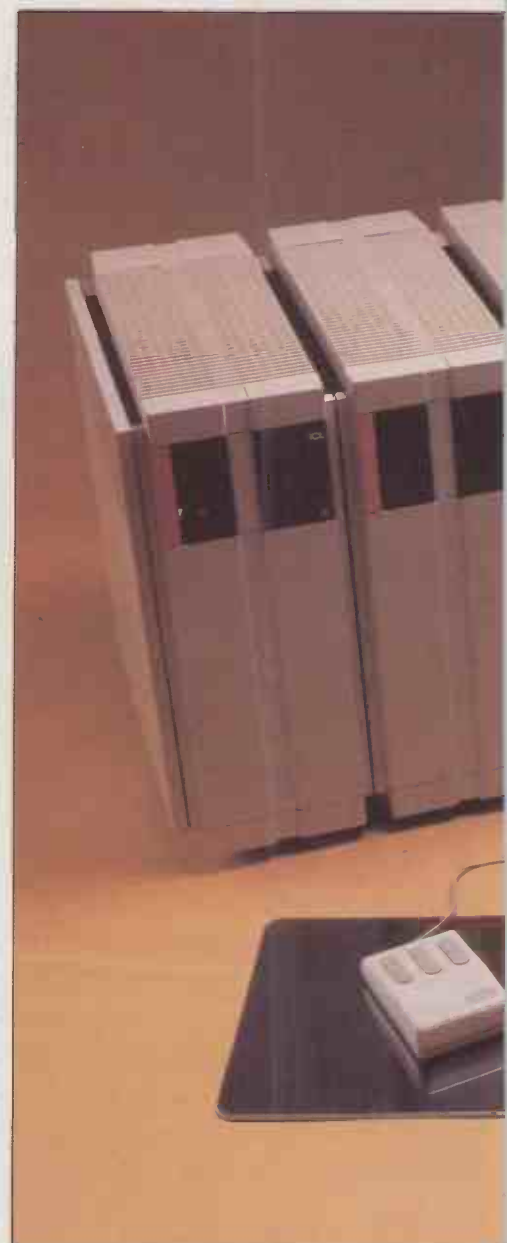
The front of the A2 sports a Reset switch and a column of LEDs which flash in sequence on power-up. An input socket for the high-level data link (HDLC) bus is hidden under the front panel. Beneath the back panel, along with the cooling fan, SCSI bus and power socket, are two 25-way D sockets which provide direct RS-232 interfaces.

There are currently four storage modules in the DRS-300 range. The D1 contains a double-sided 5.25in. drive with a 720K formatted storage capability, while the D2 has an additional 10Mbyte hard disc. D3 and D4 are Winchester-only modules, with 20Mbyte and 45Mbyte capacity respectively. The 45Mbyte D4 module was provided with the review machine.

Power for the entire system is supplied from the K1 unit, which can serve up to four other modules. Like the other units in the series, the K1 is fitted with its own cooling

fan. Additional cooling is provided by heat sinks on either side of each module and plastic grilles on the top.

The DRS-300 system is remarkably easy to assemble. Each module is attached physically to its neighbour by a clip on the right-hand side which slides over a nut on the adjacent module. The data connection is



### SPECIFICATION

**CPU:** 80286 running at 8MHz  
**RAM:** 1Mbyte  
**Keyboard:** QWERTY with cursor and numeric keypads, and 11 function keys  
**Discs:** D1 module with 5.25in. 720K floppy disc; D2 720K floppy disc with 10Mbyte hard disc; D3 and D4 20Mbyte and 45Mbyte hard discs only  
**Display:** 12in. monochrome or 14in. colour text screens with 80- by 25-character resolution; bit-mapped colour 640 by 400 pixels  
**Interfaces:** CPU module contains two serial ports, SCSI interface, HDLC jack socket

**Dimensions:** 300mm.(11.8in.) x 325mm.(12.8in.); width varies with different modules around average of 95mm. (3.7in.)

**Prices:** base configuration of K1, A2 and D2 modules £5,328; intelligent terminal £889 monochrome, £1,491 colour; bit-mapped graphics terminal £2,264, including sub-module and three-button optical mouse; additional disc units D2 £2,106, D3 £1,647, D4 £3,024

**Manufacturer:** ICL, Bridge House, Putney Bridge, London SW6 3JX. Telephone: 01-788 7272

**Available:** now





provided by a ribbon cable that clips into the SCSI ports, and a lead from the K1 module fits into a three-way socket to carry the power. Work stations can be connected either through a 25-pin connector to an RGB output on the back of the CPU module or on a bus network from the HDLC socket on the front.

Up to 16 users can be supported on the HDLC bus from a single processor. Although the mix-and-match nature of the DRS system will allow multiple processors to be used within a single unit, ICL suggests that if more than 16 users wish to use the system it is more efficient to break the unit into two, each with its own cluster. The processor supports the terminals on a round robin basis, polling each of them between two and 30 times per second to find out whether they have any information to transmit. Data is carried in 256-byte packets at the rate of 600Kbit/s.

Both the multi-user system and network operation are supported by ICL's own DRS-Net. The network system has the advantage of supporting a wide range of local area

Below: The rear of our review setup, with the A2 CPU unit on the far right.



networks ranging from the simple Microlan to the high-speed Oslan system. Microlan is adequate for a small number of users, but the amount of traffic generated by a large number of users calls for a more powerful system.

Terminals configured for the HDLC have a dedicated Z-80 processor built-in to

handle the video display. Both colour and monochrome monitors are available. Underneath the screen is a slot for a cartridge containing 32K of ROM to configure the terminal for text and hold the default font. The pack also includes 32K of RAM, of which 16K is dedicated to the screen memory.

Twin 25-way D sockets at the rear of the terminal provide RS-232C interfaces which support a printer or other serial device. As an added bonus you can hook a modem to the RS-232, take the terminal away and log on to the DRS-300 from a remote site. A special ROM pack is required for this.

A dumb terminal with just a keyboard and monitor can be connected to the DRS-300 system via the video port on the back of the CPU module. This is less efficient than using the HDLC configuration, as the terminal lacks any processor or memory capability. The screen has to be supported entirely by the main CPU, and this diverts its attention from other tasks.

### IBM-STYLE KEYBOARD

The keyboard is similar to the new IBM PC units. There are 11 function keys running along the top, with word-processing function keys such as Print and Next to the right. A numeric pad is positioned to the far right, beyond the cursor-control keys. The QWERTY keys are surrounded by the usual control keys such as Ctrl, Alt and Rub Out, though some of them are not in the positions you would usually expect. The Tab key, for example, is on the right-hand side of the keyboard, rather than the left, and the Alt key is positioned next to Q. The Shift keys are fitted on the bottom row of alphabetic keys, and touch-typists may find it a bit of a stretch to type capital Y. The feel is on a par with other high-quality keyboards.

While most self-respecting business micros run MS-DOS, ICL has chosen Digital Research's Concurrent DOS 4.1 as the DRS-300's standard operating system. The company already has a close relationship with Digital Research, and also feels that MS-DOS does not offer the necessary level of support for multi-user operation.

Concurrent DOS allows each user to run four virtual windows, each of which can hold a different application. You can flip between windows or partition the screen so that all the windows can be viewed at once. The HDLC intelligent-terminal configuration leaves enough processing power free to run the simultaneous applications at an

(continued on page 51)

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## WE'D LIKE TO SHED SOME LIGHT ON WORD PROCESSING'S NEW LEADER.



(continued from page 49)

acceptable speed. Concurrent DOS will not allow you to cut and paste data directly between applications because of the protection it creates to prevent different users overwriting each others's data. Instead you have to save a section of a window on to disc as a file and retrieve it into a different window.

Of the operating systems available which can support a multi-user environment, only Concurrent DOS and Unix have any kind of user base in the micro world. Concurrent DOS does not support real-time multi-tasking but ICL feels that the large number of business applications which already exist make it a better bet.

Concurrent DOS is compatible with both CP/M and MS-DOS, so well-behaved applications which run under either of these operating systems should also work on the DRS-300. Although this is no substitute for programs custom-written for the machine, it does help to provide a short-term stop-gap.

All the same, it would be wrong to assume that even well-behaved programs will run under Concurrent DOS without a hitch. At one point during the review we attempted to load GWBasic in order to run the Bagshaw Benchmarks. The Basic loaded quite happily but then locked us out of the system. The moral is that if you are going to run programs or data from a different machine, try before you buy.

### TIME SHARING

The operating system uses non pre-emptive techniques to share processor time between tasks. This means that each task is assigned a priority, and the operating system assigns processor time on that basis. A good example of how non pre-emptive multi-tasking is implemented can be seen when all four windows are displayed on a monitor at once. The current window receives a higher priority than the three background tasks, and runs noticeably faster as it receives more of the processor's attention.

If you are familiar with CP/M and MS-DOS you should have little trouble finding your way around the operating system, though there are one or two minor differences in appearance between MS-DOS and the Digital Research emulation. For example, within the Concurrent DOS directory listing, sub-directories are written as

```
\DIRNAME
```

rather than the

```
DIRNAME <DIR>
```

format. Concurrent DOS also has a number of features like menu construction and examining current status not available under MS-DOS. To maintain compatibility between CP/M, MS-DOS and Concurrent DOS, a number of commands are duplicated. For example, Concurrent DOS contains the MS-DOS Copy command as well as the antiquated CP/M Pip, which performs the same function.

But while CP/M and MS-DOS may look similar, they have certain differences which could prove disastrous. For instance, the

format for Copy is

```
:SOURCE:DESTINATION
```

whereas for Pip the format is reversed. To counter this problem and prevent confusion, the disc drives can be partitioned into areas where one or other of the operating systems works exclusively. The actual proportions which are assigned to each environment can be set by the user through the operating system.

Although Concurrent DOS 4.1 is not ideal as a multi-tasking operating system, it can support a number of terminals, each of which may be running different applications, spool to a printer and communicate with other processors, all within a tolerable time span. Maintaining this amount of activity slows the applications, of course, but few business programs require optimum speed.

Like MS-DOS 3.1, Concurrent DOS 4.1

ICL DRS-300	
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 checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Value for money	<input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/>

A good machine with some original design ideas. Deserves to succeed.

cannot alternate between the 80286's 286 and 8086 modes. However, the DRS-300 has the advantage over the PC/AT in starting afresh. This means that software writers will be able to write entirely in 286 mode and use the full power of the processor without having to worry about whether the application maintains compatibility with earlier versions of the machine.

Given that Concurrent DOS is a Digital Research product it comes as no surprise to find that Gem is available as a windowing environment. Although it still lacks some of the features of the Macintosh operating system, the DRS-300 implementation is faster, snappier and more colourful than early versions.

The mouse chosen to operate Gem is a deluxe item to say the least. Unlike the standard beast with a ball bearing which will scamper quite happily across any part of a desk, ICL's three-button optical mouse will only operate on a special mirrored grid.

The inevitable snag of Wimp environments is that they swallow an awful lot of memory. You will need 480K if you want to use Gem Paint. With only 1Mbyte available to be shared among a number of users, this effectively rules Gem out in a multi-user system.

Gem will not run on the intelligent terminals linked to the HDLC. Instead you have to use a graphics work station unit, which consists of a dumb terminal with

colour screen and a bit-mapped graphics card that fits into the main processor module. Because the main unit had to do all the screen handling otherwise undertaken by the Z-80 in the intelligent terminal, this has a detrimental effect on the system's overall performance.

Though you can run a wide range of MS-DOS programs under Gem, badly behaved programs such as Lotus 1-2-3 will not work. This is a serious drawback for any machine wishing to make an impact in the business market, so ICL has called in the services of Control-C to softclone 1-2-3 for the DRS-300. The product is still undergoing validation by Lotus, though ICL already has a version running the DRS-300. Softcloning is described in a separate article on page 73 of this issue.

### EASY TO UPGRADE

The great advantage of a modular design is the ease with which it can be upgraded. Innovations introduced inside a single module need not affect the rest of the system. New modules under development include a tape streamer and processor units with 2Mbyte and 4Mbyte of RAM. Looking further ahead, ICL is planning a processor module based around the 80386 processor, which may be launched some time in 1987.

On the software front, ICL expects to have Unix System V ported to the computer in the next few months. Digital Research is upgrading Concurrent DOS to take advantage of the Lotus/Intel XMA expanded memory architecture, and a new version to run the 80386 processor is also being developed.

ICL has staked a lot of development effort on its belief that the office-systems market is in for a big expansion. Its planned product range in this area concentrates particularly on multi-user and networked systems. It is still an open question whether multi-user or networked systems are the best and most efficient solutions for the office; much depends on how the relevant technologies develop.

With the launch of the DRS-300, ICL has stolen a march on the competition in the field of small multi-user systems. Only time will tell whether it will prove profitable and sustainable against the heavyweight international competition that is sure to come.

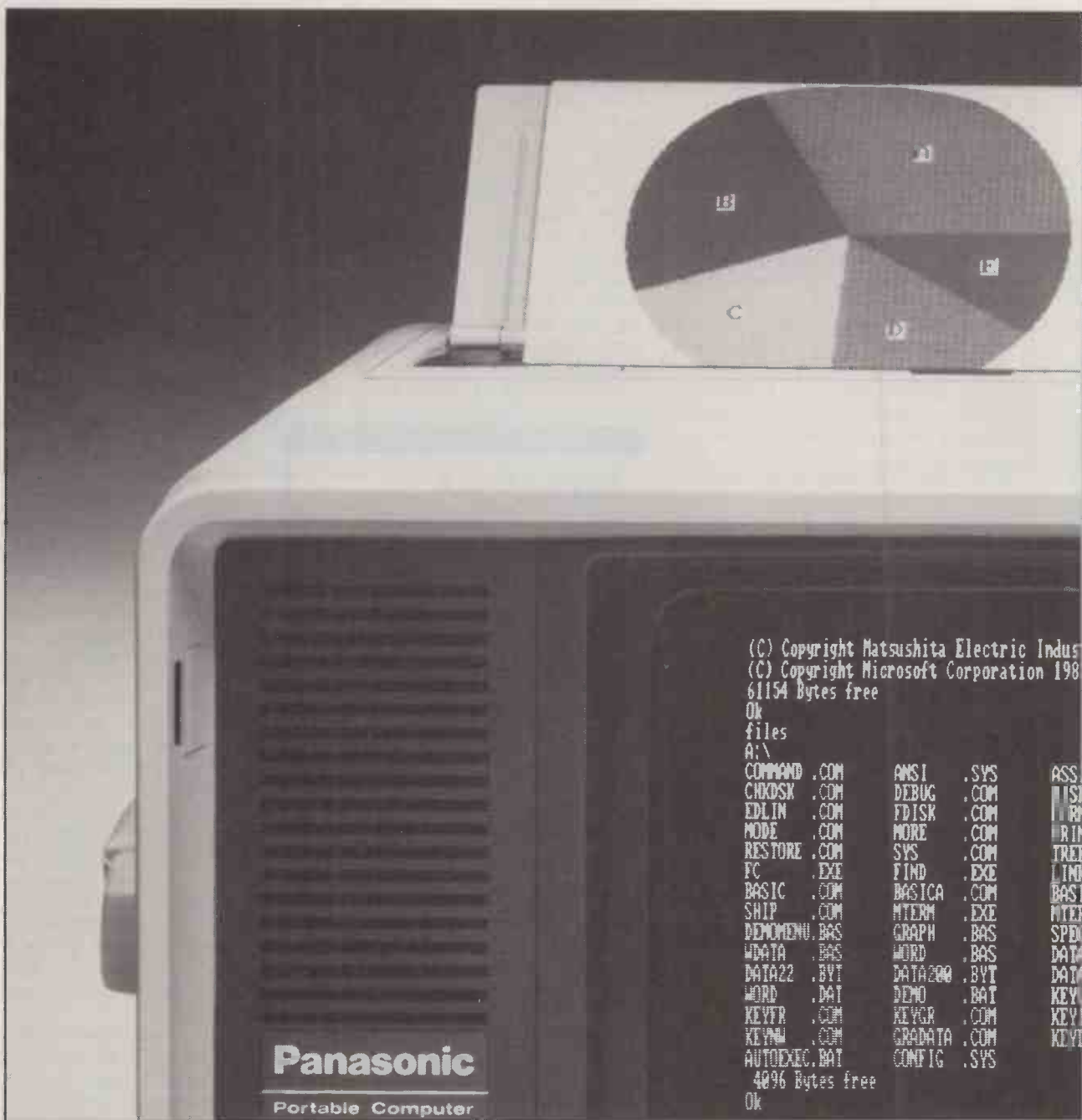
### CONCLUSIONS

■ The modular design and simple networking facilities of the DRS-300 allow great flexibility and a painless upgrade path.

■ The DRS-300 has been built with multi-user, multi-tasking operation in mind, and is among the first business-orientated micros to achieve a workable solution in this area.

■ Although ICL has taken some pains to have a large software base available at the launch, producing a non-compatible microcomputer is still a risky business. The reaction of customers and software houses has yet to be measured.

■ Companies that want to provide computing power for several people may find the multi-user solution provided by the DRS-300 cheaper and simpler than the more conventional PC network.



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# MICROBOX III GRAPHICS FOR THE SPECIALIST

By Glyn Moody

A small British company is about to market a machine which starts where the Amiga leaves off.

**T**he first thing to be said about Microbox III is that it is not exactly an Amiga clone. But the similarities are striking. Both use a member of the Motorola 68000 family. Both use Tripos or a derivative for its operating system. And both have very advanced graphics capabilities, including the ability to genlock to an external video source. The pricing is similar too: the dual-floppy model with 512K RAM will cost around £1,100, and a version with a 20Mbyte hard disc around £1,700.

Micro Concepts, the manufacturer of Microbox III, is hardly a household name even though it is a British company. Established about five years ago, it has concentrated on supplying boards for engineering and control applications. The Microbox III is intended for a similar market. Its open architecture makes it ideal for anyone with control and processing applications in mind. In its most basic form the Microbox III is embodied in a standard double Eurocard with twin 64-way DIN connector. Micro Concepts is hoping for sales of the order of hundreds in this market. These sales will effectively bankroll the project, and allow a more speculative venture in the consumer market.

The Microbox III actually goes beyond the Amiga in a number of departments. For example, the main processor is the 68010, one up from the 68000 used in Commodore's machine. Its big advantage is a six-byte cache that allows the main bus to carry data only, rather than instructions, which speeds up operation considerably.

## SPRITE MANIPULATION

There are no custom chips in the Microbox III. The machine's graphics features are controlled by two Motorola Raster Management System chips which endow the Microbox III with graphics capabilities at least as good as those of the Amiga. Its facilities include a range of sprite-manipulation techniques, allowing images or objects to be moved around on-screen with various priorities to determine what happens when they cross. One of the special functions built into the new chips is a capability for manipulating Japanese Kanji characters.

Perhaps more useful for European business users is the ability to set up several virtual screens. A maximum of 512K can be

assigned to each screen, which on its own is larger than the physically available screen. Screens can be switched in and out more or less instantaneously; fast, high-resolution animation is one obvious application of this technique.

By September Micro Concepts hopes to have an 8Mbyte expansion board, which will also have a 68881 floating-point chip and the ability to run the 68010 faster than the current 8MHz. This will speed up animation and graphics yet further, and provide the huge quantities of memory required for image manipulation. The price for this extra board is expected to be around £1,000.

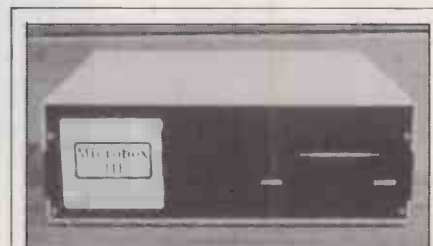
## 50 RESOLUTIONS

As far as the screen resolution is concerned, up to 32 colours can be on-screen simultaneously at a resolution of 320 by 500 pixels. With four colours resolution goes up to 640 by 500. One advantage of the Microbox III over the Amiga is that it has been designed from the start with the PAL colour system in mind. There is a range of 50 resolutions which can be used, rather like the modes on the BBC Micro.

The Microbox's single printed-circuit board is hardly overpopulated. Apart from the main chip, two video chips and memory chips, there is 8K of battery-backed RAM expandable to 64K. The board also carries two free sockets which can be used as EPROM blowers without the need for any additional equipment. Although this feature is only of interest to programmers it will save them a good few pounds.

On the board there are also two 64K EPROMs containing the Tripos operating system. Tripos was written at Cambridge University and formed the basis of Amigados, which Metacomco produced for Commodore. It is coded in BCPL and offers true multi-tasking in several layers. Multi-user operation is possible, though Micro Concepts feels that it is not really appropriate for a machine in the Microbox's price range.

The screen handling of concurrent processes is controlled by the charmingly named Vrooms or virtual raster object-orientated multi-display system. Vrooms exploits the Microbox hardware to provide the ability to flip from a whole screen in any task at any terminal, rather like that provided by Switcher on the Mac. Users will



## SPECIFICATION

**CPU:** 68010 running at 8MHz  
**RAM:** 512K expandable to 8Mbyte on expansion board; 8K battery-backed RAM

**ROM:** 128K bootstrap and operating system

**Mass storage:** two 720K 3.5in. floppies; 20Mbyte Winchester option

**Keyboard:** standard IBM PC layout

**Display:** colour circuitry as standard providing 640 by 500 pixels with four colours out of 4,096; 320 by 500 pixels with 16 colours

**Ports:** two serial, two parallel, Centronics and SCSI, mouse port

**Dimensions:** 100mm. (3.9in.) x 280mm. (11in.) x 320mm. (12.6in.)

**Software in price:** Tripos and Vrooms, BCPL compiler

**Hardware options:** 8Mbyte RAM expansion with 68881 floating-point coprocessor, about £1,000; Transputer add-on under consideration

**Software options:** CP/M-68K, OS/9-68K at £300 each

**Prices:** bare motherboard £650; twin-floppy unit with keyboard but without monitor £1,100; single floppy and 20Mbyte Winchester, keyboard but no monitor £1,700; complete colour system with Winchester and monitor £2,000

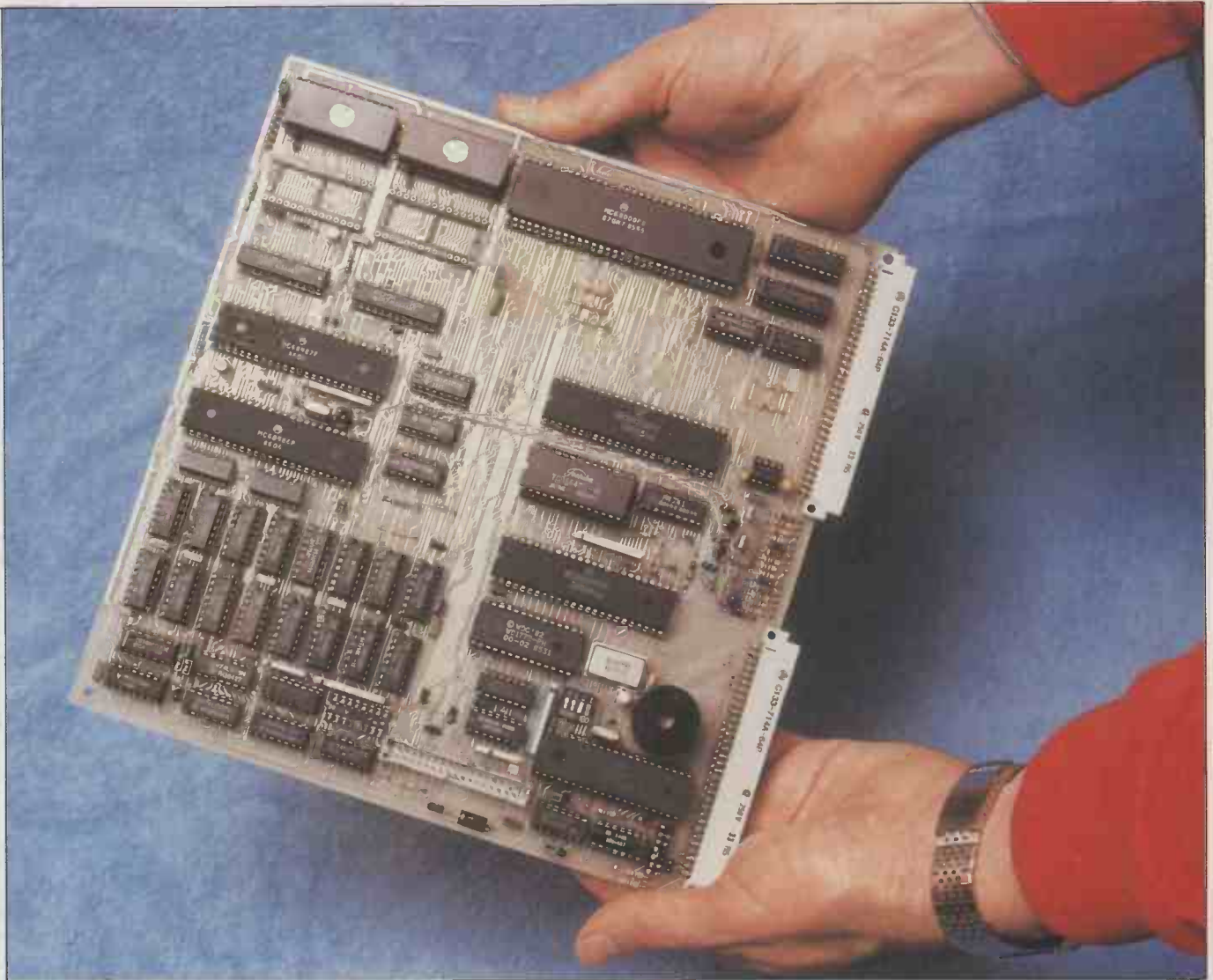
**Manufacturer:** Micro Concepts, 2 St. Stephens Road, Cheltenham, Gloucestershire, GL51 5AA. Telephone: (0242) 510525

**Available:** summer 1986

ultimately be able to select any screen from an on-screen table listing the terminals and the tasks running on them.

Other operating systems available for the Microbox III include CP/M-68K, which will come with a C compiler, and OS/9-68K. Also under consideration is Gemdos, which will provide an icon-driven front end to the whole system. A mouse option will be available. Micro Concepts also hopes to provide emulators of CP/M-68K and Gem, allowing them to be run as concurrent tasks from within Tripos.

The Microbox III is such an idiosyncratic machine that it is hard to assess its



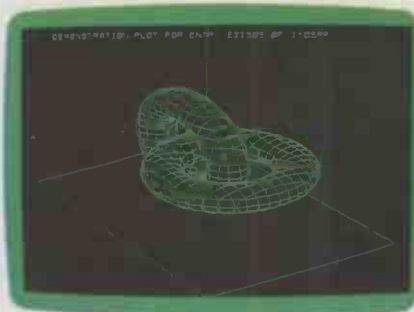
performance, especially in the absence of the trusty Basic and Bagshaw Benchmarks. The graphics demo programs I was shown were certainly impressive, and the machine's internal construction looked sound. There are a few wires on the motherboard, but they are apparently necessary to carry video signals without interference. Otherwise the overall simplicity of its hardware design augurs very well for its final reliability. The software is at an earlier stage of evolution, particularly as regards the user interface. But Tripos is an established product and so should prove reliable.

### ADVANCED ENGINEERING

Micro Concepts is probably wise to have targeted OEMs and technical end-users as the kernel of its market. The machine's advanced engineering and the ease with which it can be adapted for different applications are bound to make it popular in control and processing applications.

For the general business user, the problem is the standard bugbear of software availability. The CP/M-68K option should open up an important if ageing market sector to the Microbox III, but as yet there is not much software to run under Tripos. This is likely to keep the Microbox out of the computing mainstream.

Above: The motherboard is small and carries surprisingly few chips. Below: Microbox offers advanced graphics.



For specialist users who are prepared to tailor it for their own needs the Microbox looks very good value. The 20Mbyte system for £1,700 is very competitive. Micro Concepts is also talking about producing a colour system for around £2,000. For those who want even more power, the 8Mbyte expansion card and floating-point co-processor should provide plenty to chew on.

But Micro Concepts has even grander plans than this, in the form of an add-on box which will include a Transputer, no less. The combined unit will give the performance of a mid-range Vax minicomputer from a couple of boxes not much bigger than a foot

square and costing around £2,000. If things work out — and this is a big if, given the uncertain state of Inmos — the Transputer might even be standard on the Microbox IV, along with the top-of-the-range 68020 CPU and 4Mbyte of RAM. Video and digitising applications will be well to the fore.

It is sad that a machine as exciting as the Microbox III is not backed by the marketing clout and user readiness that are often indispensable to substantial sales. But if the Amiga takes off in a big way it is possible that the Microbox III will be able to ride on the back of its success. Even if the Amiga fails to win a big user base the British product will probably still be there, servicing the specialist markets it has wisely chosen as its foundation.

### CONCLUSIONS

- The Microbox is an advanced British product offering an unparalleled specification for a very reasonable price.
- Its main operating system is Tripos, which offers true multi-tasking but is short on applications software.
- The graphics facilities are exceptional; they are probably of most relevance to specialist applications.
- The products in the pipeline, including a Transputer add-on, are even more impressive in their performance.



# MITSUBISHI G-500 QUALITY COLOUR

By Ian Stobie

A new kind of thermal-transfer technology offers very high-quality colour printing, but at a price.

**A**ll the fuss about lasers and new kinds of letter-quality matrix printers has diverted attention from developments in colour printing. While this market is still dominated by moving-pen plotters, ink-jet printers and impact matrix printers with multi-coloured ribbons, one other technology has been steadily gaining in importance — thermal transfer.

In the May 1985 issue of *Practical Computing* we reviewed a remarkably cheap colour thermal-transfer printer, the Okimate 20. Since then the Okimate has fallen further in price to £165, and a new class of very high-performance thermal-transfer colour printers has begun to arrive. The £3,933 Mitsubishi G-500 is one of the first to go on sale in the U.K.

The cost of the Mitsubishi machine means that it will appeal only to those users with a high-volume requirement for colour printing, such as corporate graphics and design departments and commercial art studios. However, the technical innovations it employs may eventually find their way into cheaper products aimed at the heart of the general business-graphics market.

Thermal-transfer printers work by pressing tiny heating elements against a ribbon coated with a wax-based ink, melting the ink on to the paper beneath. For colour work this sort of printer uses a ribbon divided into several different coloured sections, a separate pass being required for each colour.

## SMALL ELEMENTS

Thermal transfer's big advantage over the other printing techniques, which also build up an image from a pattern of dots, is that the heating elements can be made very small. Consequently there is the potential for achieving a large number of dots per inch and hence very good print quality.

The low-cost Okimate 20, for instance, employs a full 24 elements in its print head. The head scans across the paper horizontally in the same way as on a conventional impact dot-matrix printer, building the image up in a series of left-to-right passes. It achieves a resolution of 144 dots per inch this way, but it is slow. The Okimate takes at least 10 minutes to dump a typical IBM screen.

Mitsubishi's machine, by contrast, has a massive 2,048-element print head, and is

much quicker. The elements are arranged in a single row just over 8.5in. long. The print head is fixed permanently in a horizontal position, and produces a complete row of dots at a time as the paper moves under it. This approach gives very high resolution at a reasonable speed. The Mitsubishi G-500 prints at a resolution of 240 dots per inch, and takes a minute or two to produce a full-page colour image from an IBM PC.

As you would expect from the 20-fold price difference, there are also other differences in performance between the Okimate 20 and the Mitsubishi machine. Registration on the Okimate is not perfect, so there are usually detectable stripes of extra density or arbitrary textured effects visible on the output. The Mitsubishi, by contrast, seems to be completely without this problem, producing output of almost magazine-like quality.

## THREE PASSES

Mitsubishi generates full-colour images by printing the three subtractive primary colours one after another. The G-500's print ribbon takes the form of a thick roll of film, 10.5in. wide, divided into cyan, magenta and yellow panels. Each panel is the same size as a sheet of paper. The G-500 first prints the cyan parts of the image, then feeds the paper back, advances the ribbon to the start of a magenta panel, prints that, then rewinds a third time to do yellow.

Three colours are in fact all you need to achieve a full range of shades. By simply overprinting a pair of colours you get red, green and dark blue, and all three colours together give a solid-looking black. To get more subtle shades you need to mix the colours in a pattern of dots in a similar way to magazine printing. How many shades depends on the particular graphics software you are using.

We were impressed by the quality of the images the printer produced when connected to an IBM PC clone fitted with an enhanced colour-graphics board. The G-500 is good enough to be used as an alternative to an A4 plotter for some drafting applications, in conjunction with a package like Autocad. For this sort of work you would probably use only the G-500's seven solid colours; the advantage over a similarly priced plotter is considerably greater speed.

But the G-500 really comes into its own for presentation graphics, where bold text, business charts and graphic images are frequently combined to get the maximum impact. Here the images often involve broad

areas of colour and a wide range of tones, both of which are hard to achieve with a plotter. Thermal-transfer technology scores over most forms of ink-jet and impact matrix printer in the depth and saturation of colour it can achieve — especially on overhead projector transparency film.

Running costs for the G-500 are not negligible, but can still be favourable compared to getting artwork prepared by outside commercial studios. The film comes in rolls which cost £29 and yield about 150 printed pages, giving a ribbon cost of about 20p per page.

The G-500 does not work well on ordinary paper as it requires a particularly smooth surface. A 2,000-sheet box of suitable 8in. deep fanfolded paper from Mitsubishi costs £82, or about 4p a page. Mitsubishi also supplies overhead projector transparency film by the roll, and paper in larger sizes.


The machine is relatively quiet in operation, at least as compared to a matrix printer. Thermal transfer itself is silent, and there is no noise from head movement, but the very precise stepper motor responsible for moving the paper through the machine in 1/240th of an inch increments makes a noise like a loud fridge. At the end of each colour pass there is a solid clunk as the head is moved back to allow rapid reverse feeding of the paper.

At the moment the G-500 is too expensive for all but the most intensive graphics user. Mitsubishi obviously has the capacity to build a slightly cheaper machine to tap the mass business presentation-graphics market if it chooses too, but if the company has such plans it did not reveal them to us. But the G-500 does demonstrate that a fixed-head thermal-array printer is a viable way of producing high-quality colour graphics.

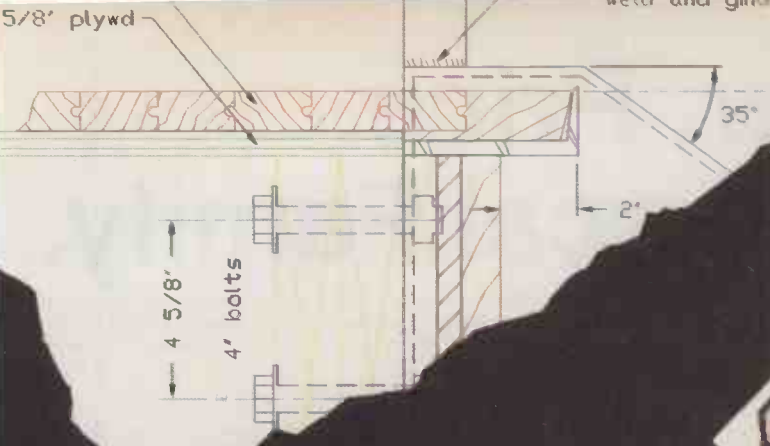
## CONCLUSIONS

■The G-500 achieves a new level of quality for colour printing, but at a price that will restrict its use to high-volume users. Thermal-transfer printing using a very large static print head is clearly a viable technical approach.

■Operation is rapid, given the very high resolution achieved, and the output is in more strongly saturated colour than that produced by most competing ink-jet and impact matrix printers. The G-500 is built to a generally high standard, eliminating the imperfections of registration found on most cheaper printers.

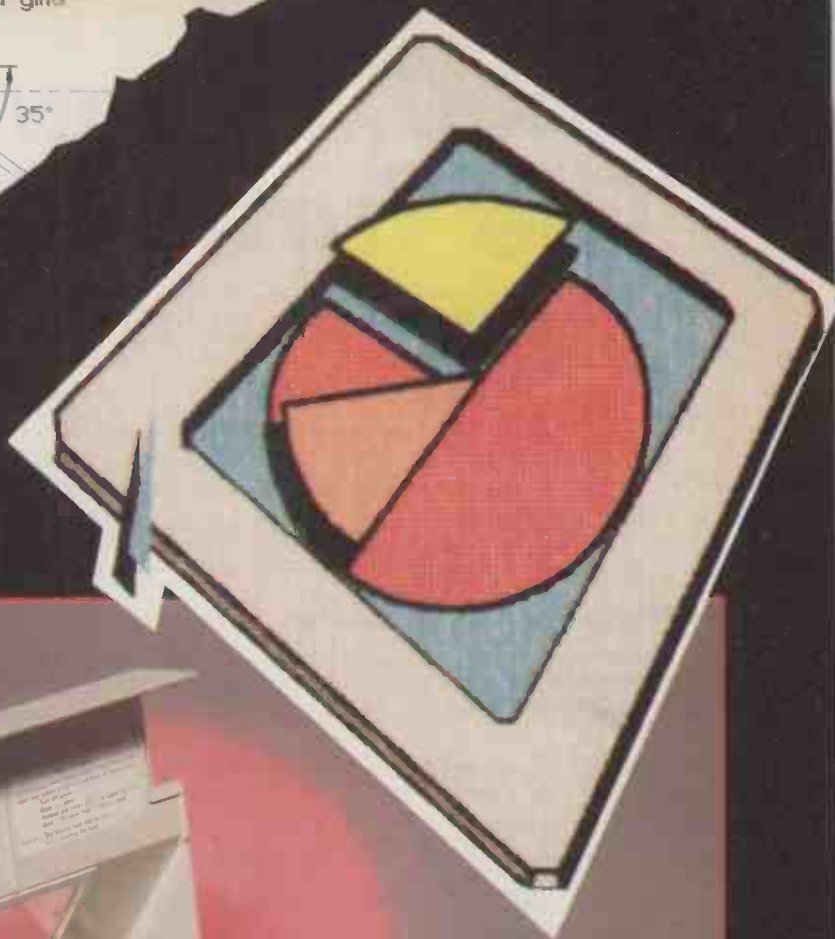
■A disadvantage for some application is the need to use special shiny paper. However, the G-500's ability to print on to overhead projector film is strong compensation. 





Right: Output magnified 150 percent, showing solid colours and shades.

Above: Line-drawing quality is good enough for the G-500 to be used as a fast alternative to a plotter.



### SPECIFICATION

- Description:** colour-graphics printer
- Printing method:** thermal transfer from three-colour film ribbon
- Print head:** fixed 2,048-element thermal array
- Print width:** 8.5in.
- Resolution:** 240 dots per inch
- Colour:** seven solid colours, other shades obtained by dithering under software control
- Speed:** about 1 page a minute
- Paper type:** glossy fanfold paper up to 12in. wide; overhead transparency film
- Interfaces:** Centronics parallel; RGB or composite video optional
- Dimensions:** 450mm. (17.7in.) x 450mm. (17.7in.) x 160mm (6.3in)
- Price:** £3,933.
- U.K. supplier:** Mitsubishi Electric, Hertford Place, Denham Way, Maple Cross, Rickmansworth, Hertfordshire WD3 2BJ. Telephone: (0923) 770000
- Available:** now

The G-500 opened up to show the three-colour film roll at the front.

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# KAYPRO PC

## RETURN OF THE CARD CAGE

By Ian Stobie

Kaypro has made upgradability the selling point of its PC clone.

All IBM clones have to be pretty similar to achieve IBM compatibility. This creates a problem for the clone manufacturer: how to differentiate its offering from all the others crowding on to the market.

Of course, it helps if you already have a well-known name, as Kaypro has. Its reputation was really made with a series of cheap and reliable transportable machines which offered good value rather than style. The new £1,246 Kaypro desk-top continues this utilitarian tradition.

Another favourite solution to the differentiation problem is to give the clone some startling or unusual feature. Kaypro has focussed on upgradability, and the Kaypro PC is built in a different way to most IBM clones. The motherboard has been kept as simple as possible while all the major components, including the 8088 processor, have been put on to removable circuit boards.

Rather than invent some outlandish new bus of its own Kaypro has opted for standard IBM card slots. Inside the Kaypro's sheet-metal system box are nine IBM card slots, three of which are occupied, plus a power supply and twin disc drives. One of the slots contains the standard processor board with an 8088 on it. This is the board you replace to convert the system to an AT-alike. The AT card is promised for the near future and will contain an 80286, although we could not get one to review. Pricing is expected to be around £700, or £550 if you send back the standard 8088 card.

The second occupied slot contains the video board. The standard machine comes with a monochrome video board but we opted to look at the multi-video board, which supports both text and graphics and provides outputs to drive monochrome and colour monitors. With some IBM clones, such as the Epson PC, you have to pay extra for even a monochrome video card.

The third slot contains a multi-function board with 256K of RAM, the floppy-disc controller, and serial and parallel ports. There is room on this board for you to expand memory up to 768K, which would take you up to the 640K MS-DOS limit and give you 128K for a RAM disc.

Our system came equipped with two 360K floppy-disc drives. Kaypro is also

selling a hard-disc model, which costs £1,777 for a setup with one floppy and a 20Mbyte hard disc. Also included in the price of both models is an AT-style keyboard and a 12in. monochrome monitor manufactured by Philips. We found the monitor gave a good, clear, steady image, but the long-persistence phosphor was irritating when scrolling rapidly through documents.

For a low-cost system the Kaypro is very well packaged and documented. Most purchasers will probably get the optional £45 pack of software, so for practical purposes it is best considered bundled with the system.

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PC VERDICT				
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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"/>

Straightforward but well presented. Better possibilities for expansion than many of its rivals.

The Kaypro User Guide describes clearly the process of setting up the system. The other manuals for the bundled software seem to have been rewritten so that specific Kaypro features are fully covered. This good impression is marred by the noisy fan which starts up as soon as you turn the system on, but MS-DOS boots up straight away, taking the time and date from the built-in clock.

Running the Disc Benchmarks reveals the floppy drives to be quick. Discs are one area where manufacturers attempt to save money, so Kaypro is to be congratulated for producing a machine which is quicker in this department than the IBM PC.

The Basic Benchmarks executed at about the same speed as the IBM PC, which is to be expected as both machines use the same processor and run Microsoft GWBasic.

Best-known of the cheap software is WordStar, which comes with mailmerge, the matching Correctstar spelling checker and Starindex, which helps you create tables of contents and alphabetic indexes. The most interesting package in the bundle is Polywindows, which is a memory-resident



### SPECIFICATION

**CPU:** 8088 running at 4.77MHz; optional AT card has 80286

**RAM:** 256K standard, expandable to 768K

**Discs:** two 5.25in. 360K floppy drives; PC-20 model has one floppy plus a 20Mbyte hard disc

**Display:** monochrome display controller and 12in. monochrome monitor generating standard IBM text display; optional £92 multi-video card which lets you display 640-by-200 graphics

**Interfaces:** six free internal IBM expansion slots, three full-length, three half-length; serial and parallel ports are standard

**Standard software:** MS-DOS 2.11 in price; WordStar, Mailmerge, Correctstar, Polywindows and Mite comms package, £45

**Price:** £1,246 for standard system with 256K RAM, two floppy drives, text-display controller, monochrome monitor and keyboard; £1,777 for PC-20 model with one floppy drive and a built-in 20Mbyte hard disc

**Hardware options:** 512K memory upgrade £77, 14in. colour monitor £414, 80286 AT card about £700, or £550 on swap basis

**Manufacturer:** Kaypro Corporation of California; made in U.S.A. and Taiwan

**U.K. supplier:** Quest International Computers Ltd, School Lane, Chandlers Ford, Eastleigh, Hampshire SO5 3YY. Telephone: (04215) 66488


**Available:** now

utility like Sidekick. It provides notepad, calculator, calendar and card-index functions which come up on the screen when you hit Control-Escape which you are in the middle of an application.

All the common IBM packages we tried ran on the Kaypro PC without difficulty. Flight Simulator, Lotus 1-2-3 and VCN Execuvision worked well with the colour monitor.

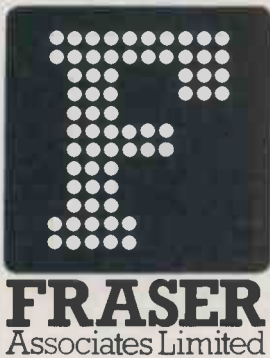
### CONCLUSIONS

■ Kaypro has produced a good-value IBM clone. It is easy to set up, well documented and comes with a good selection of cheap business software.

■ The Kaypro PC offers six free expansion slots, and the option to upgrade later to an AT-compatible machine. 

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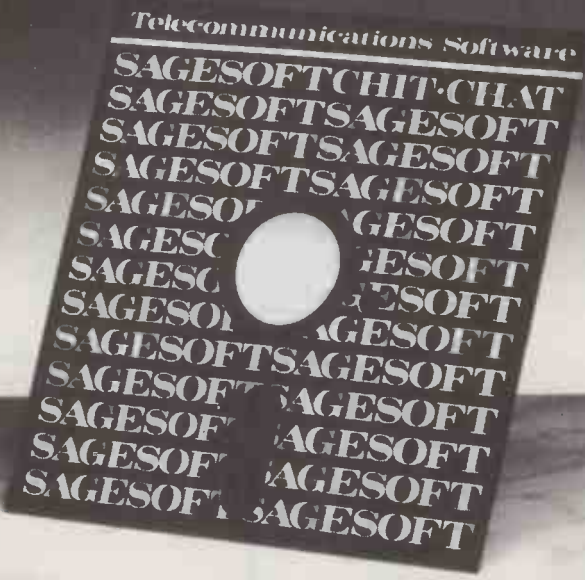
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# ATARI ST PROGRAMS A MIXED BAG

By Jack Schofield

Considering the comparatively recent arrival of the ST system the amount of software available is impressive. But although home users are well catered for there is a dearth of high-powered programs for the more demanding business user.

The Atari 1040STF is one of the few micros that can still pull a crowd. The small size, megabyte of RAM, built-in 720K disc, Mac-like colour screen display — brought by the Digital Research operating environment Gem — and low price make it one of the most interesting micros around. But any machine that needs to earn its keep also has to offer software, and so far the ST is doing pretty well for a new micro. There are already over 200 programs available from over 100 different software houses. According to Atari's claimed sales of software-development systems, over 1,000 programs are on the way.

At the moment, serious ST software can be divided into three main groups: languages and utilities, productivity software, and business programs including accounts and vertical applications. In the long term it will be interesting to see which emerges as the predominant category, but as with the early days of the BBC Micro the mixture is part of its charm.

Software is obviously reviewed in more depth in dedicated magazines like Dufosse Publishing's *ST User*. Here we survey the field in a way that will be interesting to people who do not own an ST, but might be thinking about buying one.

Languages and utilities is the strongest software area at the moment, and the strongest sub-category is the C language. The Atari ST software-developers' kit includes DR's version, but so far it looks as though the Lattice Logic implementation, supplied by Metacomco at £99.95, will triumph. Other versions of C for the ST include GST's QC, Haba Hippo-C, Megamax C, Philon's Fast C and Computer One's C Compiler.

Pascal users will note that Borland has not yet managed to put Turbo Pascal on the ST, so it might be a good time to switch to Modula-2. This language, supplied by TDI at £195, is Wirth's Super Pascal and is standardised; variations are generally a bugbear of Pascal. However, Pascal addicts can choose either UCSD Pascal from TDI, Meta Pascal from Metacomco, Hisoft Pascal, or Prospero's ISO Pro Pascal. Philon, Computer One and Borland also have versions on the way.

The ST comes with Digital Research Logo and DR Basic on disc, but the Basic is

relatively slow and has a reputation for being buggy. Unconfirmed rumours suggest that Atari is going to launch a Metacomco Basic. There is also Henry's Fundamental Basic from Philon, and at least two Fast Basics. Fast Basic-M from Philon costs £99 and is claimed to be Microsoft MBasic compatible. Fast ST Basic from Computer Concepts — best known for its Acorn BBC software — will offer a BBC-type command set on cartridge for £77.

Where the ST's DR Basic is slightly slower than an IBM PC/AT, Computer Concepts reckons its Fast Basic will be twice as fast, and about five times as fast as the standard BBC Micro language.

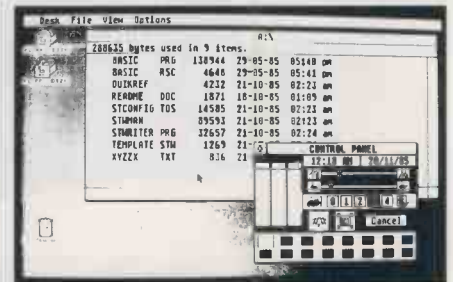
Other ST languages include an excellent Fortran suite from Dragon Group, versions of Fortran from TDI and Prospero, Micro-APL from the firm of the same name and Lisp from Metacomco. Both Fast Fortran and Fast Cobol are expected this summer from Philon at £249 each. You can run Micro-Cobol under the BOS operating system but then you lose access to Gem.

## PC-DOS DOWNGRADE

Among the utilities, there is a just usable screen editor from Metacomco and handy sets of tools from Haba, Microdeal, Kuma and Paperlogic. Paperlogic's £29.95 ST-Toolbox provides a command-line processor which makes the ST look just like a boring old PC-DOS machine. The public-domain Kermit file-transfer utility is included with the Atari software-development system.

All in all there are enough languages and software tools for the Atari ST to be a viable software development system in its own right, rather than as a target machine for programs written in C on an IBM PC and ported across. The high standard of languages make the ST usable by those people who have to write their own software, say for research, scientific and engineering purposes. Potential buyers with this in mind should look at the Modula-2 and Fortran 77 packages.

The high-level languages, ease of use of Gem, megabyte of RAM and low price must also make the 1040ST appealing for computer studies and further education. A few STs networked to a hard disc with Software Punch's Atarinet, plus C, Modula-2, Lisp and Fortran, would go a



Desk accessories supplied on disc as standard include Control Panel.

long way to liberating some currently overburdened minis for only two or three percent of the cost.

Office-productivity software includes all the programs which are used across a wide range of applications. The major examples are word processors, spreadsheets, databases, graphics packages and communications software.

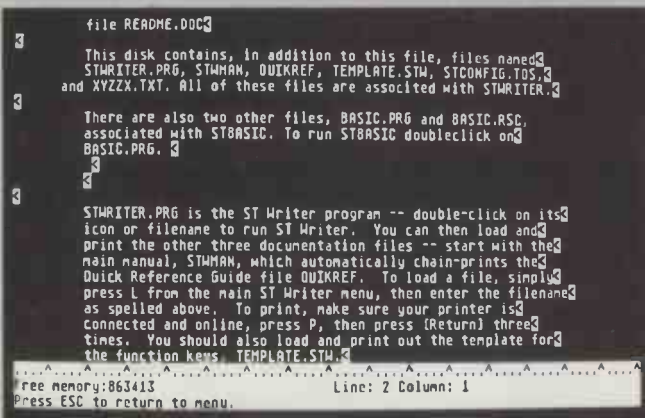
To make the 1040ST immediately useful, Atari decided on the Apple/Sinclair technique of supplying a couple of free programs. Originally these were supposed to be Digital Research's Gem Write and Gem Paint but they never materialised. Atari needed some quick substitutes and came up with ST Writer, 1st Word and Neochrome. But the database which was supplied with the 520ST, DB Master One, is no longer included and a spreadsheet has never been part of the package.

ST Writer started as a conversion of the eight-bit Atariwriter program, which falls somewhere between Wordwise and View in style. It is old-fashioned in using commands like Ctrl-L to set the left margin, Ctrl-R for the right, Ctrl-B for bold text and so on. It is not WYSIWYG, so you have to go through a tedious preview mode to see how text will be printed out. It makes no use of the Gem interface.

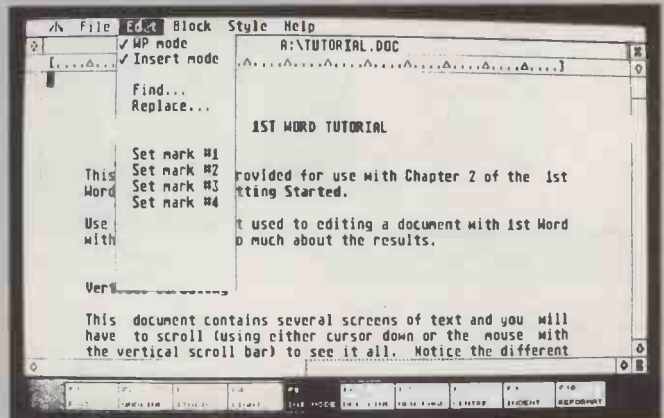
On the other hand it has several virtues. It uses a mere 32K, which leaves you some 970K of memory free for text, it has useful block and chaining commands, it is very easy to use, it really works and it is free. With the monochrome monitor, ST Writer puts 37 lines of stable 80-character text on the screen in either black on white or white on black. If you wanted to buy this capability from IBM, I dread to think what it would cost.

The British package 1st Word is much

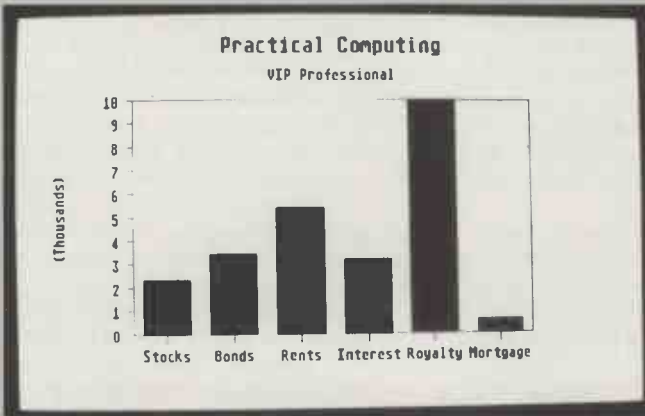
## PRODUCTIVITY PROGRAMS



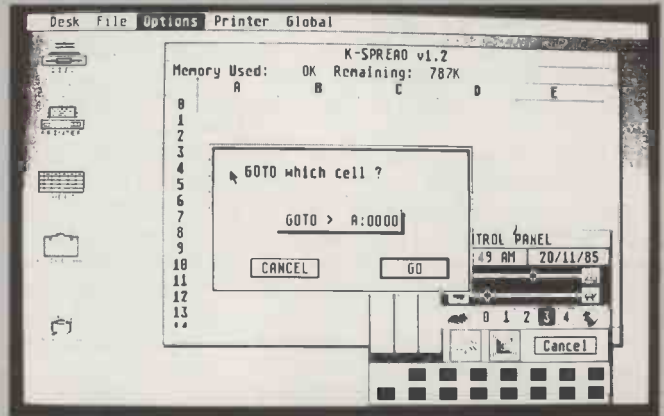
ST Writer is a converted eight-bit program.



Menu and mouse operation feature in 1st Word.



VIP: the only choice for serious spreadsheeting.



K-Spread is easy to use, but limited in scope.

more like Macwrite. It uses pull-down menus and mouse selection, though the ST's 10 function keys are also utilised. 1st Write has five fonts and attempts to provide a full WYSIWYG display, though combinations like bold underlined italics look a mess. You can have up to four windows open at once. Of the two free programs, 1st Word is easier to use — at least to begin with — while ST Writer is faster, more powerful and holds more text. A secretary might stick with 1st Word, especially for short texts; a writer would probably switch to ST Writer.

### POWER PROGRAMS

Anyone who wants something fancier will have to shell out for an extra word processor. Options include BOS Writer, Haba Writer, Hippo Word, Express Letter Pro, Andra ST, Regent Word and The Final Word. Word-processing accessories include Regent Spell, Hippo Spell and Haba Merge.

Hippo Word and Boffin are also mouse-driven programs, the latter British. BOS Writer and The Final Word are old programs which have been transferred from other systems and which are mouse-free. The Final Word really is that ancient CP/M program from Mark of the Unicorn, a close relative of both Mince and Perfect Writer I, which a few love but many hate.

There are three spreadsheets available for the ST range: BOS Planner, K-Spread and VIP Professional. Of these, K-Spread is

cheap and cheerful, though limited, while VIP Professional is a clone of Lotus 1-2-3. K-Spread, which costs £50 from Kuma, comes in a small box with a 20-page manual. It is a mouse-driven windowing program, and takes up about 80K, which leaves lots of room for your spreadsheet — around 130K in a 520ST, even with TOS loaded from disc. You can have up to five windows open at once.

Like 1st Word, K-Spread is friendly and very easy to use. But it offers a very limited range of functions, and entering large amounts of data is tedious in the extreme. Perhaps it is the ideal spreadsheet only for someone who does not really need a spreadsheet.

VIP Professional, which costs £200 from Software Express, comes in a big box with a 260-page ring-bound manual. It is a nearly exact clone of the famous Lotus 1-2-3 spreadsheet, including graphics. Indeed, VIP allows files to be produced which are claimed to be 100 percent compatible with Lotus 1-2-3 files from an IBM PC. However, the version I tried did not include any of the mouse and windowing features promised, which may have been just as well considering how little room the program leaves for data.

For example, suppose you start with 512K of RAM. The VIP code is about 277K. When you load it, it grabs 64K for two 32K graphics buffers, which is what enables you to flick between the spreadsheet and

graphics. The operating system grabs yet more workspace and somehow you can end up with less than 80K for data. This might seem a lot compared to the 21K available in eight-bit VisiCalc, but the data storage is not as efficient, so even with TOS in ROM it is not possible to construct decently large spreadsheets. With a disc-based 520ST you might as well forget the whole thing. A 1040ST with ROMs is the way to go.

The alternative solution is a program called VIP Lite, a text-only version which does not have the database and macro facilities of the Professional version. Also, like Lotus version 1 it is limited to 2,048 rows instead of the full 8,192. VIP Lite remains an excellent spreadsheet and users of Lotus 1-2-3 on micros like the IBM PC will hardly need to look at the manual. However, that will not satisfy people who are changing from IBM PCs to Ataris. It would be much more interesting to have the full mouse-driven VIP to compare with something like Microsoft Excel on the Macintosh.

As VIP is currently really the only choice of spreadsheet for serious ST users — not counting BOS — one warning is in order. VIP has gone through several versions, and some early releases had bugs. It is important to make sure you get the latest version and the upgrades as they appear.

Many people will find the data handling of VIP Professional enough for their purposes, but others will want a proper database. Again, the ST has a limited

(continued on next page)



A Splat form from DB Master One.



The excellent Neochrome is free.



A screen produced by Colourspace.

(continued from previous page)

selection: DB Master One, Laserbase, H&D Base, Zoomracks, BOS Finder, BOS Auto-clerk, Hippo Simple and Habadex. DB Master One was free with the 520ST, but is not supplied with the 1040ST. Again, this program is extremely easy to use. It works like a card-index file, with the pull-down menus and mouse interfaces making it even friendlier than, say, Cardbox or Superbase 64.

One of the menu-bar options on DB Master One is called Splat. It offers a small set of ready-to-use fields such as Mailing list, Checkbook and Date. You can construct a simple flat file at incredible speed just by picking them off and slapping them down, splat!

Another low-priced British program, Laserbase ST, is more sophisticated than DB Master One but it is also easy to use. It is very much Apple Macintosh software, being a conversion for the ST. The Atari version seems just as good and is £31 cheaper at £99 including VAT.

Less worthy of consideration are Hippo Simple and Habadex. Hippo Simple looks too simple to be worth bothering about. Habadex is almost a computerised phone book. At £60 its main claim to consideration is auto-dialling via a Hayes Smartmodem.

Because of the advanced colour-graphics facilities built into every ST, there are already some excellent drawing and painting programs available. The one you get free, Neochrome, is superb even though it appears to be a limited version of a commercial package yet to be launched. Anyone who has used Macpaint or Gem Paint will feel immediately at home with Neochrome, and enjoy the extra speed and colour even more.

For those who want to produce more business-like graphics, Ariolasoft has

launched the Design and Entertainment Graphic Arts System (Degas) written by Batteries Included. Degas offers similar facilities but with more options plus a few extras including mirror-image drawing, a fount editor, user-designed fills and shape drawing. Both programs produce 32K screens and Degas has a utility to convert Neochrome screens into its own format. This is useful because Neochrome is the better sketch pad. Degas is good value at £40. Other options include Typesetter ST and Hippo Art, both at £40, Easy-Draw at £150 and Graphics Artist at £495.

Communications is another area where commercial software houses have to compete with something that is free on the ST, in this case a VT-52 terminal emulator. It is unsophisticated but works fine for bulletin boards, etc.

## TERMINAL EMULATION

The first two programs available are both American. Chat can be obtained from SST at £30 and PC Intercom from Mark of the Unicorn at £130. The latter provides VT-100 terminal emulation too, as does Kuma's forthcoming £50 K-Comm. Other U.K. packages are being written, with facilities such as a buffered 1,200/75 baud for Prestel and support for modems like the WS-2000 to make these more attractive.

In the productivity area the Atari ST is still weak. There are some good packages which will suit most home users and some business users. The selection includes 1st Word, DB Master One, Neochrome and Degas. They would also be attractive for secondary schools, if only Research Machines did not give such a big discount on the Nimbus.

Power users who need slick professional packages like Microsoft Word, Multiplan 2, dBase II or III, Framework, the Smart suite and the like will find the ST range sadly lacking. Only in the VIP Professional Lotus clone does ST software start to deliver the real potential of the hardware. And it is some time since Lotus 1-2-3 could be considered state-of-the-art.

Until very recently the Apple Macintosh was very weak in accounts programs and vertical-market applications; it even took the IBM PC a couple of years to get going. However, the Atari ST range started with a bang by making the BOS operating system available.

BOS, the Cobol-orientated Business Operating System, does not offer mice and

windows or much in the way of exclusivity because the software runs on a wide range of micros. However, having BOS does make at least 50 vertical-market applications programs available. These packages include insurance broking and print estimating from Wasp, property information from Faithfull, Daisy Dairy Herd Management from the University of Reading, LDS-Access from Lawdata, membership management from Paradigm and Oscar Film Industry Accounting from Users Friendly. BOS Software itself has a full suite of single and multi-user accounts packages for tasks ranging from Fixed Assets and Invoicing to Purchase Ledger and Payroll.

Systematics International has also put its well-known and highly respected range on the ST, though buying all of them separately would not leave much change from £3,000. For those who think £345 is a bit pricey for a Systematics Sales Ledger, several firms have cheaper offerings that may be worth a look.

Most ST software can be obtained from Silica Shop and Software Express. Atari Corporation also publishes an ST Software list which includes the addresses of over 60 suppliers.

The ST range offers a cheap option for many small business users as long as the package they happen to want happens to be available. However, not all such buyers will choose the extra power of an ST over, say, a cheap Taiwanese IBM PC compatible or even an Amstrad PCW-8512.

## CONCLUSIONS

■ There is enough free and cheap software for the Atari ST range to satisfy most home users, including those who do a limited amount of work from home.

■ In vertical markets and accounts programs, the ST is doing better than might have been expected. It is potentially a great machine for the education market.

■ The ST range is woefully short of power-user business programs that can compete with the heavyweights on the IBM PC and Macintosh. VIP Professional is a start but on its own it is not enough.

■ Considering the Atari ST system has only been on general sale for about six months, after an earlier but premature launch announcement, the software availability is impressive. If the promise of "Let a 1,000 software programs bloom" comes true, then the ST range looks likely to become a real force in the world market, not just in the U.S. and Germany.

## SUPPLIERS

**Atari** Atari House, Railway Terrace, Slough, Berkshire SL2 5BZ. Telephone: (0753) 33344.

**Silica Shop** 1-4 The Mews, Hatherley Road, Sidcup, Kent DA14 4DX. Telephone: 01-309 1111.

**Software Express** 514-6 Alum Rock Road, Birmingham B8 3HX. Telephone: 021-328 3585.

**ST User** Dufosse Publishing, 43 South Street, Chichester, West Sussex PO19 1DS. Telephone: (0243) 783932.



# ATARI ST



## Power Without The Price!

### FREE SOFTWARE

When you buy one of the new Atari ST computers from Silica Shop, you will receive a large and varied software package free of charge. This package covers several applications and comprises a total of nine titles. All ST's now have TOS/GEM on ROM, and the total list of free software is as follows:

- 1) GEM - DR Desktop environment with WIMP (in ROM)
- 2) TOS - Tramiel Operating System (In ROM)
- 3) 1st WORD - Word Processor by GST using the GEM environment and multiple windows
- 4) BASIC - Personal Basic by DR (with manual)
- 5) LOGO - Logo language by DR (with manual)
- 6) DOODLE - Simple paint/doodle drawing package (works on mono or colour systems)
- 7) MEGARIDS - Asteroids type game by Megamax
- 8) NEOCHROME - A powerful colour paint and graphics package (only useable with colour systems)
- 9) CP/M EMULATOR - Allows the use of DR's Z80 C/PM software to run on any ST system

### 3rd PARTY SUPPORT

The power and potential of the ST range of computers is causing a flood of new software titles, peripherals and accessories from third party manufacturers. Titles range from word processing to spreadsheet programs, from graphics and games to database management - all with those easy drop-down menus and windows. With the list of companies producing ST software including dozens of top names, you can expect some first class titles for the new ST range. The following includes a selection of the third party manufacturers who have developed, or are working on, products for the ST range:

ABACUS	EXTENDED S/W	MICRO-ED INC	ROBINSON SYS
ACADEMY	FIDELITY	MICROPHO	SCARBOROUGH
ACCOLADE	FIRST BYTE	MICROPROSE	SIERRA ON LINE
ACTIONSOFT	FIRST PUBNG	MICROPRO ENG	SM SOFTWARE
ANTIC	FLIP 'N' FILE	MIGRAPH INC	SOFTK
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ASHTON TATE	HIPPO	MONARCH DEV	SOFTWARE PUNCH
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CHANG LABS	LIONHEART	PARADOX	TALENT
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CROSSBOW MUSIC	MAP COMPUTERS	PLANTIR	TOP EXPRESS
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DATAQODE SYS	MARK WILLIAMS	PROSPERO	TYNESOFT
DATA SYSTEMS	MARTIN CONSLU	PRYORITY	UNISOP
DELTRON	MCGRAW HILL	PSION	VIP
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### 520ST-M

**NEW 512K 520ST-M KEYBOARD:** The new 520ST-M keyboard costs only £346.96 (+VAT=£399) and is yet another price breakthrough for Atari Corporation. The keyboard now includes both an RF modulator and cable, allowing you to connect it to an ordinary domestic television set. In addition, the keyboard is supplied with 512K RAM, a mouse and a free set of 3 1/2" disks containing applications software. The TOS operating system and the GEM graphics package are now supplied on 192K ROM chips which are already installed in the keyboard. This means that the operating system will automatically boot in when you switch the power on. In addition to the keyboard, you will also need to purchase either a 1/4Mbyte disk drive (RRP £130+VAT) or a 1Mbyte disk drive (RRP £174+VAT). Either disk drive will provide you with fast information retrieval and a vast amount of storage space. If you prefer not to use your own TV set, you may connect your ST to a monitor. You may purchase the Atari SM124 monochrome monitor (RRP £130+VAT), or one of Atari's two Thomson colour monitors. Alternatively, you may choose one of the many third party colour monitors which are available.

**NEW 1024K 520ST-M+ KEYBOARD:** In addition to the standard 520ST-M, we have a new keyboard which we are calling the Atari 520ST-M+. The M+ is a 520ST-M keyboard which has been enhanced by a third party RAM upgrade to 1 megabyte of memory. The 520ST-M+ is available from Silica at a retail price of only £433.91 (+VAT=£499). This product will provide you with an alternative to the 1040ST-F, but at a lower price. Additionally, it features the advantage of the 520ST-M's built in modulator.

# £347

### 1040ST-F

For the businessman and the more serious home user, Atari have introduced the 1040ST-F, a low cost powerhouse which can be introduced to a business environment as a stand-alone system, or can support a mainframe computer as a terminal. The new one megabyte 1040ST-F enhances Atari's 'value for money' reputation in the marketplace as it is the first personal computer available with one megabyte of memory for less than £800. You can purchase the 1040ST-F as a monochrome or colour system. The price of the monochrome system is £799 (+VAT = £918.85), with the colour system at only £999 (+VAT = £1148.85). The new 1040ST-F not only features twice as much memory as the 520ST-M, but also includes a one megabyte double sided disk drive and mains transformer, both built into the console to give a compact and stylish unit with only one main lead. The 1040ST-F is also supplied with a free software package. Unlike the 520ST-M, the 1040ST-F was manufactured solely with business use in mind and as such is supplied with a monitor. It does not include the RF modulator or lead. We now have stock of the 1040ST-F at all four branches of Silica Shop. Call into your nearest branch for a demonstration.

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### THE ATARI EXPLOSION!

If you read the specialist computer press, you will have noticed that there is one company which is getting a large slice of editorial space at the moment, that company is Atari Corporation. Atari have been making the news since the launch of their new 16/32 bit range of ST computers. Led by the powerful figure of Jack Tramiel and under the banner 'Power Without The Price', Atari are manufacturing new computers at unheard of prices, with the power to challenge firmly established market leaders. With the introduction of IBM compatibility, a CP/M emulator, a powerful networking system and a communications package for their new low cost powerhouses, it doesn't look as if it will be long before there is an explosion of the magnitude which will see Atari placed firmly besides such names as IBM and Olivetti in the personal computer marketplace. Read on for more details of what Atari are doing, and how they are putting their 'Power Without The Price' computers beyond the reach of the competition.

### FREE CP/M EMULATOR

This newly announced CP/M Emulation Package, will enable software written under Digital Research's Z80 CP/M operating system to be run on the ST family of computers. There are several thousand applications written for CP/M in the UK alone, and several of the major CP/M software development houses may convert their programs to 3 1/2" disk format for the ST range. The CP/M emulation package is supplied FREE OF CHARGE by Silica Shop with all ST computers.

### IBM COMPATIBILITY

To make the ST available to those businesses who currently run IBM systems and are looking for a low cost expansion method, Atari have announced a co-processing unit for ST computers. This processor will open the ST range to all IBM or IBM compatible software applications. The unit, which attaches to the ST computers via the DMA (Direct Memory Access) port, contains an Intel 8088 processor with 512K of RAM and will accept a 5 1/4" disk drive. In it's ST mode, the unit will also act as a second disk drive, offering the user an additional 500K of memory. The IBM co-processing unit should be available in late Summer 1986. If you would like to be informed when it is released, please complete and return the coupon below. We will send you further details as soon as we have them.

### 20Mbyte HARD DISK

The new Atari hard disk for the ST range has just been released. All ST computers already have a hard disk interface built into them so there is no external interface required. The memory size of the disk is a massive 20 megabytes (unformatted) with a data transfer rate of 1.33 Mbytes per second. At a price of £739 (+VAT=£849), the 5 1/4" hard disk offers massive storage with fast access at a very reasonable price.

### NEW ST SOFTWARE PACKAGES

There are now hundreds of software packages which have been announced for the Atari ST range. Titles available now include DB Man, a DBase 3 clone as well as H & D Base, a DBase 2 clone. In addition, PC Intercomm is a VT100 emulator which enables you to use any ST keyboard as a terminal connected to a mainframe or mini. Other programs include a Lotus 1-2-3 clone (see paragraph below).

### VIP PROFESSIONAL - LOTUS 1-2-3" CLONE

This is probably the most impressive program to have been released so far for the ST range. VIP Professional is an extremely easy to use, integrated spreadsheet, database and graphics program which is identical both in features and commands to Lotus 1-2-3". The same spreadsheet analysis, information management and extraordinary business graphics are all combined in one easy to learn, affordable package. What's more, VIP Professional not only has all the features of 1-2-3", you can also type the same commands to do the same things. Probably the most surprising feature of VIP Professional is not its total compatibility with Lotus 1-2-3", nor its ease of use, but its price. Lotus 1-2-3" for the IBM PC/AT costs £395 (+VAT=£454.25), whereas VIP Professional for the ST is a mere £169 (+VAT=£194.35). That's less than half the price! If you would like further details, of VIP Professional, please return the coupon below.

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# TRAVELLING SIDEKICK JUST A GIMMICK?

By Glyn Moody

This address book and appointments program linked with a ring binder may appear to be just an executive toy. But coming from Borland's successful stable it could well prove to be more.

The rapid development of Borland International has been a heartening example of continued innovation and enterprise. Where other major players like Lotus and Ashton-Tate have had one big success which they have used to fund acquisitions rather than a series of new products, Borland has consistently struck out in new directions.

It resurrected Pascal practically single-handed with the launch of its founding product, Turbo Pascal. It then went on more or less to invent the category of memory-resident or pop-up programs with its Sidekick utility. Since then it has won much praise for its Turbo Lightning, reviewed in March's *Practical Computing*, as well as applause for acquiring the database Reflex and promptly reducing its price by about 80 percent. Most recently it has announced Turbo Prolog, another innovative product.

In the light of Borland's enviable record for picking out niche markets and inventing whole new applications, its launch of Travelling Sidekick is intriguing. Despite the name this is quite a different program, and a radically different concept, from Sidekick itself. Apart from the fact that Travelling Sidekick is not memory resident, the most striking thing about it is the ring binder it comes in. This is no mere fancy packaging; it lies at the heart of the new product.

Travelling Sidekick is based on the observation that memory-resident utilities like address books and diaries are all very well provided you are sitting at your computer. Much of the time you are not, yet you still need the information. Travelling Sidekick is designed to make the transfer of such information to hard copy as easy as possible. The ring-binder provides the carrying case for all this output, as well as reference information typically found in organisers like Filofax.

Great pains have been taken to make Travelling Sidekick easy to use. The basic opening screen consists of a menu with three options: Addresses, Engagements and

Setup. There is also a note of the current default files for both Addresses and Engagements. Selecting any of the options produces a pull-down menu with options allowing you to add, delete or sort addresses and engagements. You can also print them out in a form suitable for including in the ring-binder.

The print options lie at the heart of the program. You can print personal telephone directories, full addresses, selections by name, firm and address, and mailing labels. Similarly there are various options for Engagements, such as a daily, weekly, monthly or annual calendar. Once again, you can apply selection criteria before printing. However, I encountered a slight problem here.

When you print out an engagements diary, you are offered the option of choosing the date by altering the default values. If

TRAVELLING SIDEKICK				
PC VERDICT				
	POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input type="checkbox"/>	<input 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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

A useful executive toy with greater potential.

you alter them and then return to the printing process, there is no problem. However, I found that simply moving around or pressing any characters other than figures caused the whole system to lock up. The only way out was to reboot. If this is not a bug, it is bad error trapping.

The Setup option on the main menu allows you to alter the default files and determine the print mode. There is a very useful appendix in the Travelling Sidekick manual which gives the various codes necessary to change the print format. From the Setup menu you can also use Sidekick files.

Although the ring-binder is nothing special, even with its solar-powered calculator, disc-holder and pen, the idea of offering a combined software-cum-book solution has potential. Borland has limited itself unnecessarily by choosing to include



## SPECIFICATION

**Description:** address and appointments software with binder for hard copies

**Hardware required:** IBM PC, PC/AT or compatible with at least 256K RAM

**Copy protection:** none

**Price:** £47; Sidekick and Travelling Sidekick £83

**Publisher:** Borland International, Scotts Valley, California

**Distributor:** Softsel, Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD. Telephone: 01-568 8866

reams of information about Borland products in the reference sections along with maps and telephone dialling codes. If it had been more catholic in its choice the appeal would have been wider.

It is easy to dismiss Travelling Sidekick as a gimmick designed to tickle the executive's fancy. But Borland is not noted for its follies. Its track record is impressive, and those who scoff at this computer-age version of the Filofax organiser could well find themselves embarrassed by its eventual success. A factor in this could be the pricing.

As usual, Borland has adopted a pricing level which is so aggressive as to border on the reasonable. If the basic price of £47 is too much for you, the offer of Sidekick and Travelling Sidekick for £83 might prove more tempting. At the moment there is only a U.S. version, but it is likely that a European version will appear in due course. If the idea takes off, we can also expect refinements of the basic concept.

## CONCLUSIONS

■ Travelling Sidekick is an address book and appointments program which is linked with a physical ring-binder.

■ It is very easy to use, even if the facilities are basic.

■ Apart from one minor bug, the software worked perfectly.



A vintage computer monitor is shown from a slightly elevated angle. The screen is dark, and the text 'The Qume PLUS Concept.' is printed in a large, white, serif font across the top half of the monitor's frame. Below the monitor, a keyboard is visible, featuring a numeric keypad on the right and a row of function keys (F1-F16) at the top. The keyboard has a light-colored face with dark keys.

# The Qume PLUS Concept.

A close-up photograph of a person's hands wearing a racing helmet and red gloves. The hands are positioned as if holding a steering wheel. The background is a solid blue color.

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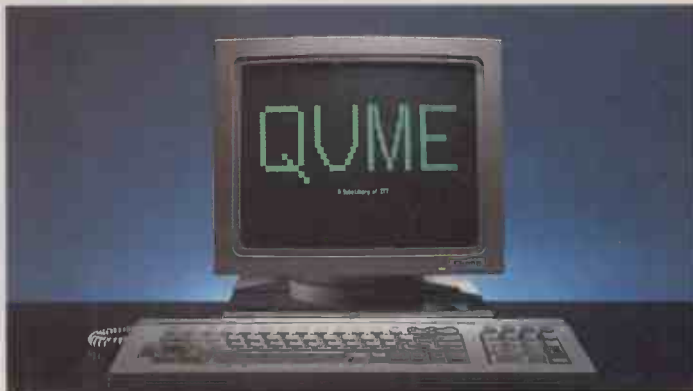
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# AMSTRAD WP

## ALTERNATIVES TO LOCOSCRIPT

By Susan Curran

There is a choice of word-processing programs for the PCW machines.

**U**ndoubtedly the Amstrad PCW-8256 and its sister machine, the twin-disc 8512, are the best buys on the market today for people wanting to get a foothold in professional word processing. They already have a large installed user base. They also, unfortunately, have many disillusioned users.

The reason is obvious, at least to anyone who understands computers. CP/M systems of any kind are not easy to use; single-disc CP/M systems are pigs to use. And for the price of an Amstrad a new user cannot expect much hand-holding from the dealer.

It is easy for a novice to blame most of the difficulties that they experience on the software, and in particular on the Locoscript word processor that is supplied with the machine. This leads them to the conclusion that a new program — WordStar, say, which sounds comforting familiar — will solve all their problems overnight.

To see how far this theory holds true I tested both the Amstrad machines with three word-processing packages that now run on them: Locoscript itself, Pocket WordStar, and New Word. The 8256 itself and Locoscript were both reviewed by Glyn Moody in *Practical Computing's* November 1985 issue.

### LOCOSCRIPT ADVANTAGES

Locoscript has several great advantages over the competition. First and foremost it is properly installed to run on the Amstrad and uses all its features fully. It makes good use of the many special keys, and it makes very good use of the printer, which is capable of quite a variety of typestyles. Only an extremely thoroughly modified standard CP/M program can rival this. Locoscript is also adapted to the Amstrad's balance of disc and RAM memory, which is unusual for a CP/M system. Working out how to handle disc and RAM space, including the virtual drive M, is not always easy with other programs.

Locoscript is a pretty good program. It has a fair range of facilities orientated towards the author or journalist — and many authors and journalists have bought Amstrads. However, it does not have mail-merging, and this will be a drawback for some business users. Those wishing to indulge in large-scale mail-merge activities really need



### SPECIFICATIONS

<p><b>NEW WORD</b>  <b>Description:</b> word processor with mail merge and spelling checker  <b>Copy protection:</b> none  <b>Price:</b> £69 including VAT  <b>Publisher:</b> Newstar Software, 22 Middleton road, Brentwood, Essex CM14 8DL. Telephone: (0277) 220573  <b>Available:</b> now</p>	<p><b>POCKET WORDSTAR</b>  <b>Description:</b> word processor with mail merge  <b>Copy protection:</b> none  <b>Price:</b> £49.95 including VAT  <b>Publisher:</b> Micropro International, 28-31 High Street, London SW19 5BY. Telephone: 01-879 1122  <b>Available:</b> now</p>
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a machine with more disc space anyway. Neither does it have a spelling checker, though I find this no great loss since spell checking on a single-disc machine is an extremely slow and tedious business.

The trouble with Locoscript is that it is a difficult program to learn. That is also true of the other Amstrad programs we have looked at. Although there are easier CP/M word processors they seem to be thin on the ground for the Amstrad. Locoscript may also prove limiting if you want to buy a daisy-wheel printer; it does not have a wide range of printer drivers, and is really only orientated to the Amstrad's built-in printer.

Pocket WordStar for the Amstrad is based on Version 3.0 of the original WordStar. It

includes Mailmerge but not Spellstar. Journalists and dealers keep saying that there are infinitely better programs around than WordStar, and so there are, but nobody ever listens. WordStar is solid and reliable, as millions of users can testify. Lots of people know it already, and Pocket WordStar has been well modified for the Amstrad. The installation process puts the program itself on drive M, leaving the floppy drive free to hold documents.

The program responds rapidly, and is adapted to use the Amstrad's cursor keys, Delete keys and so on. It has a flexible menu system which can be suppressed for experienced users. It deals fairly well with long documents. It is good on search and replace functions. WordStar lacks any macro facility, which is a feature Locoscript has and which cuts down on keystrokes considerably. The program also makes margin and tab changes unnecessarily clumsy.

WordStar reproduces justification on-screen but not underlining, boldface or similar features. It does not reformat text automatically after editing changes, though it does so rapidly on request. Among its other failings is the lack of a word count. It does not keep track of free disc space; you have to watch this very carefully, otherwise you will lose work when files grow too large for available space.

The program defaults to draft print on the Amstrad printer but this can easily be

LOCOSCRIPT		VERDICT			
		POOR	AVERAGE	GOOD	EXCELLENT
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ease of use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Value for money	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Best support for the Amstrad printer.					



**AMSTRAD PCW-8512**

The 8512 is the Amstrad upgrade from its original word processor, the 8256. It runs exactly the same software but it has twice as much internal memory and a double-sided double-density disc drive in addition to a single-sided single-density drive like that built into the PCW-8256. While 512K of memory is not unusual on a 16-bit system, it is something remarkable on an eight-bit machine like this where the processor can directly address only 64K. The extra 256K is not used for working memory, but to add to the capacity of the RAM disc. This makes it large enough to hold, for example, a spelling checker and a large document to be checked.

It is handy to have a second disc, as anyone who has struggled with the tedious disc-copy procedures on a single disc drive will know. But Amstrad has negated some of the advantages by going for a different disc capacity. On the 8512 machine the top disc, A, is single-sided and single-density; the bottom disc, B, is double-sided and double-density. You therefore have to keep different sets of discs to use in the different drives, which is all the more tricky because the two kinds look identical. Though it is possible to copy single-sided discs from B to A you cannot copy the double-sided discs without the same old interminable disc changes.

Overall I would have much preferred two identical disc drives, even if that meant having less capacity. But at the mere £100 price increase for a substantially improved specification, maybe that is churlish of me.

Is it worth paying the extra? Certainly the Amstrad is perfectly usable as a cheap word processor using Locoscript with just one drive. But if you want to run other CP/M programs, and especially if you are looking to use spelling checkers, the extra capacity on the 8512 makes a considerable difference.

much space left in drive M for saving documents to be checked. Printer support is fairly good, though precise support for the Amstrad printer is not clearly described in the manual or supplement.

New Word scores over WordStar in showing underlining and boldface on-screen. It also has an undelete feature, more flexible arrangements for alternative rulers, column mode, neater printer support and a

tidier arrangement for opening new files. Its manual is plainer but its only other real disadvantage is the lack of a background-print facility.

New Word has its own mail-merge facility, and it also comes with a spelling checker, Word Plus. It checks spelling out of context but will provide a few words of context on request. You can add to the main dictionary and set up specialist dictionaries. Utilities provided include a word count, anagram finders and a Homonym Help feature that draws your attention to potentially troublesome words that you may want to check for their correct meaning in a conventional dictionary.

**CONCLUSIONS**

■ Locoscript, New Word and Pocket WordStar are all competent all-round word processors.

■ None of the packages is easy to learn.

■ New Word and Pocket WordStar are both good choices for those wanting mail-merge facilities for support for other printers.

■ New Word has several small advantages over Pocket WordStar, including its spelling checker.



**POCKET WORDSTAR**

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

A good choice for the single-disc Amstrad.

changed from the Amstrad printer menu. Most other printer features can be controlled by WordStar, but the program has never shone on control of dot-matrix printers; sometimes the arrangements are not as clear as they might be. WordStar is fine, of course, if you want to switch to one of the other printers it supports. Pocket WordStar comes with Mailmerge, the form-letter utility. Mailmerge is reasonably powerful, though not easy to use.

**LIKE WORDSTAR**

We looked at version 2.17 of New Word. I found it unnervingly similar to WordStar: almost all the familiar WordStar commands work, with just the occasional difference to catch you out. Help level 0 in New Word, for instance, is accessed by Ctrl-JJ instead of Ctrl-JH and does not display a ruler on-screen.

Unlike Pocket WordStar, New Word does not let you use the Amstrad's special keys or the cursor keys. You have to use Control combinations in order to move the cursor. For example, Ctrl-E moves the cursor up. Advocates of WordStar used to argue that this is a positively desirable feature for touch-typists, but I find the cursor keys much more convenient. It is a pity not to be given the choice.

New Word provides a standard CP/M manual with an Amstrad supplement, as does Pocket WordStar. I found the New Word supplement very confusing, and failed repeatedly at the recommended installation procedure. It is possible, once you know what you are doing, to copy the New Word files into drive M and leave the floppy drive free for documents. But this causes problems with the spelling checker on the 8256, since it only works with documents saved on disc and there is not

**NEW WORD**

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

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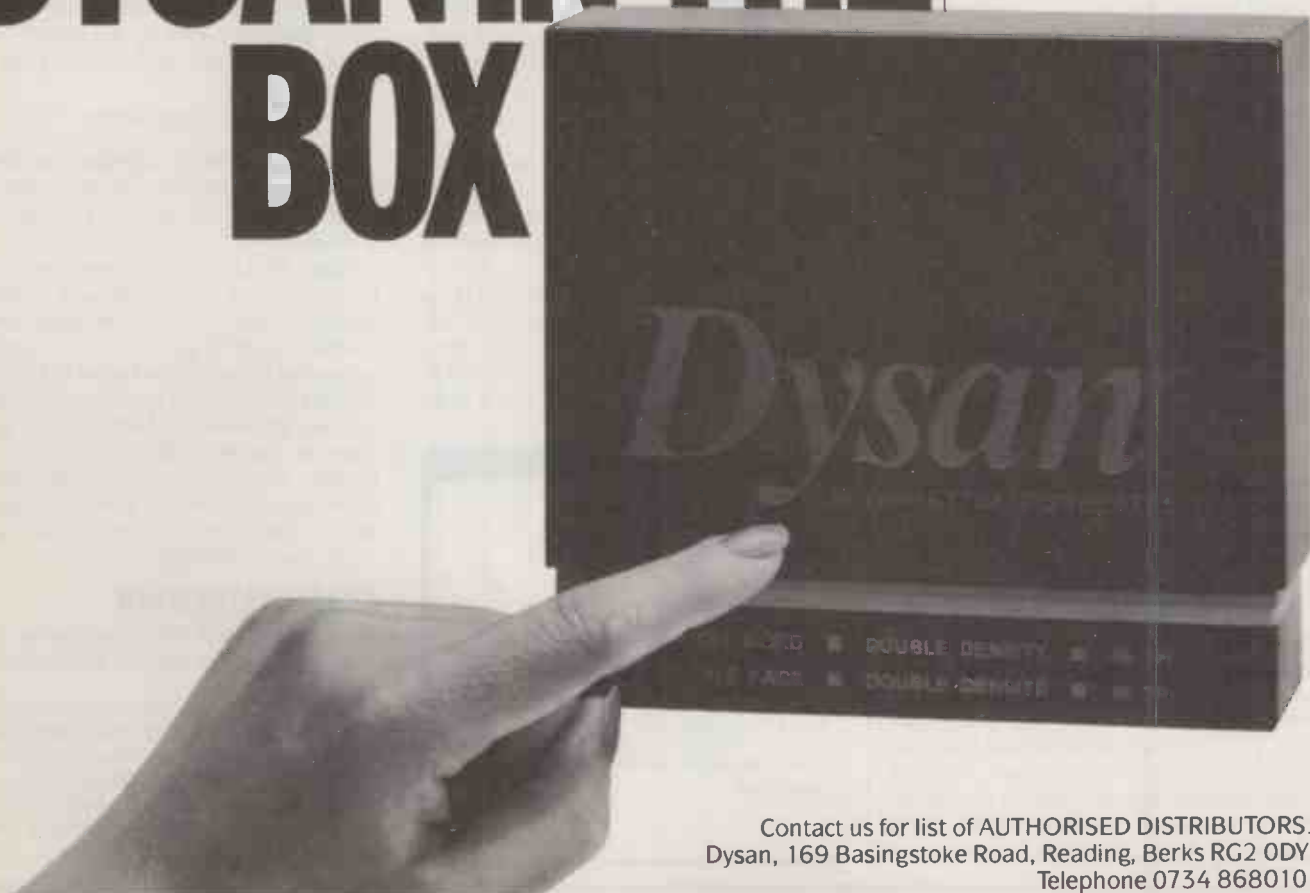
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# SOFTCLONING

**Steve Malone** explains a technique which allows manufacturers of idiosyncratic machines to offer access to all the best-known IBM software.

**T**he ability to run IBM software has long been the key to success for business micros. Many technically advanced computers have fallen by the wayside simply because they ignored this point; manufacturers have been faced with the choice of forsaking innovation and falling in behind Big Blue, or else writing off a large slice of their potential sales. But a solution is now becoming available which will allow the best of both worlds.

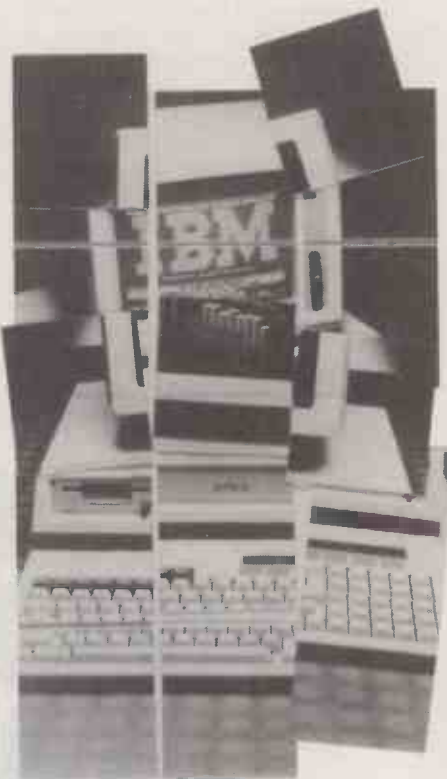
A consultancy firm called Control-C Software is now making available its technique of softclone technology. The idea is that a program designed for IBM hardware can be altered in memory to enable it to be run on a computer with different architecture. Control-C originally developed the technique following a request from Apricot's American arm. The company was having trouble getting dealers to stock software for the Apricot range and wanted the machines to be able to run programs like Lotus 1-2-3. Although Lotus had adapted 1-2-3 for the Apricot computers, dealers were reluctant to tie money up in the relatively slow-selling Apricot version.

A badly behaved program like Lotus 1-2-3 will only run on the IBM PC and compatibles, not just any MS-DOS micro. This is because it makes direct calls to the video RAM. Softcloning makes 1-2-3 work on an Apricot by intercepting the code that calls the video RAM, and altering it so that the instructions are directed to suitable addresses within the host computer.

There are two sections to the softclone program. The first part, the softclone loader, is specific to a particular machine but independent of the software. To load a badly behaved program into an incompatible machine the softclone loader is run first. The loader then asks DOS to load the application. After the application has loaded and the DOS is convinced that all is well the loader then fetches the second part of the softclone program from disc.

## PROGRAM DESCRIPTOR

This section, called the program descriptor, contains data fragments and odd lines of code specific to the application as well as to the machine. The softcloning process goes through the memory image of the application and changes any badly behaved lines of code to instructions suitable for the host computer, using data from the program descriptor. Where the alterations cannot be fitted into the available memory space, a Jump instruction is inserted in the application. When the application is run, control passes to the program descriptor, which executes the appropriate code before returning to the application.



At first sight softcloning might seem to require massive amounts of code, but this is not the case. For example, the spreadsheet calculation part of a program like 1-2-3 can be left exactly as it is; only the I/O needs to be changed. Control-C estimates that only about 0.03 percent of 1-2-3's code needed to be changed to enable it to run on a non-IBM machine.

Given that the technique of softcloning is merely a matter of patching existing code, it should be possible to make any program run on any Intel-based machine with adequate memory. What softcloning cannot do is make up for hardware deficiencies: if a program demands a graphics display no amount of softcloning will make it do without one.

A software house might be expected to take a dim view of other people interfering with its code; in fact Lotus is said to find the idea of softcloning "intriguing". The company has yet to give its seal of approval to the softcloned versions of 1-2-3 but has made its validation suite available to Control-C, which in turn has passed on the softclone kit. Lotus is anxious that users get adequate support for the softcloned versions and that quality is maintained.

Several micro manufacturers have shown interest in the technology as a way of broadening the potential market of their computers. For example, ICL has introduced

softcloning on to its new DRS-300 micro — reviewed on page 48 of this issue — which can run Lotus 1-2-3.

In contrast, Apricot feels that its U.K. software base is sufficiently large for it to be able to manage without softcloning. The company is still evaluating the product, and sees softcloning as a useful development tool for software houses that wish to adapt IBM programs for the Apricot range.

At the moment softcloning only works with machines built around an Intel CPU chip and software designed to run on IBM machines. But Control-C is investigating the possibility of extending the technology to other fields, one of the projects with this aim in mind being Duet — short for DOS Unix Emulation Technology. Duet is designed to make up for the absence of any major software packages which run under Unix, this being one of the obstacles to its widespread adoption. Control-C intends to develop a system where an application program that normally runs under MS-DOS can be made to run under Unix.

## PIANO DUET

There are two different projects under the Duet umbrella. Piano Duet is designed to run with the Intel 286 and 386 family of processors. Adaptations would be made to the software which would allow control to pass from the application to MS-DOS, and then to Unix which would run the hardware.

The other area of research is Forte Duet. This is a more difficult project which is intended to work with the Motorola 68000 family of processors. In this case, Unix might be written in the native code of the processor, but an 8086 emulation program has to be provided around it to translate the application's memory image into the 68000's code. This could slow the application down considerably on the 68000. But a number of Unix computers use the 32-bit 68020 processor, and here the speed difference between 8086-emulated code and a real 8086 may be minimal.

Softcloning has become a possibility because the industry-standard hardware — the IBM PC — is so technically backward compared with most other current micros. Whether this state of affairs will continue is debatable. Control-C itself admits that the idea has arrived five years too late.

It is also not clear whether softcloning will be to the ultimate benefit of those manufacturers of more advanced machines who are now keen to adopt it. A software house need only write to the standard, knowing that softcloning will ensure that it appears on other computers. As a result manufacturers may find even less software being written for their machines.

It costs money to match the right software to the right hardware to do the job you want. Choosing the wrong hardware or software costs even more. Those who are aware of the pitfalls of installing or upgrading a computer system often seek professional advice. Yet the question of which system to opt for can soon be replaced by another one: where do you get advice from.

Sources of advice range from professional bodies, friends, books and magazines to dealers and consultants. If your industry has its own trade association it may well be able to recommend what system to use, or refer you to someone accustomed to dealing with problems in your area of concern. For example, the National Association of Estate Agents set up a working party which spent three years examining various systems before drawing up a short list of approved software packages for its members.

If you have no such body to turn to, friends, books and magazines may help. But make sure the experience they offer is relevant to you. Otherwise the temptation is to rely on your dealer or go to a consultant. The difficulty here is that it is hard to ensure that the advice you get will be both impartial and expert.

If you go to a dealer the danger is that you may be recommended a particular product just because it would be an especially lucrative sale. But there are reputable dealers that offer some kind of consultancy service, and they will no doubt be very familiar with the hardware they sell. A good dealer will also have checked out the software packages on offer, and will know which applications they are best suited to. However, dealers may only be experienced in a limited selection of machines.

## NO GUARANTEE

The next step up the ladder is to opt for a consultant. The stumbling block here is that anyone can call themselves a consultant and there is no way of picking someone with the right experience to deal with your problem.

Several organisations representing sections of the computer industry make lists of consultants available to the public. In some cases their members undergo vetting procedures to ensure that any claims they make are true, and are bound by codes of practice and codes of conduct. It is worth finding out such details from the bodies concerned.

The Computer Services Association (CSA) has a Directory of Members and Services which lists all its members and gives a description of their specialisations. It will also circulate details of the service you require to potential suppliers, who will contact you. The CSA gives general advice to enquirers.

As a trade association representing the interests of consultancies and similar companies on the services side of the industry, the CSA is obviously concerned primarily with helping its own members. The same can be said of all the associations and societies mentioned here. They are a good way of contacting consultants but do

not guarantee that they will be the right one for you.

Another useful organisation is the Association of Independent Computer Specialists (AICS), a kind of Computing Services Association for smaller firms. If you contact AICS you will be put in contact with members who live locally or who specialise in your particular market area.

The Association of Professional Computer Consultants (APCC) also offers a list containing short profiles of its members' relevant experience. Its members are not allowed to write software for clients — though they may well be capable of doing so — but have to call in someone else.

The British Computer Society provides a leaflet entitled *Counsellors and Consultants*, which gives the names of those who may be able to resolve matters in particular fields. The Institute of Management Consultants has a members'

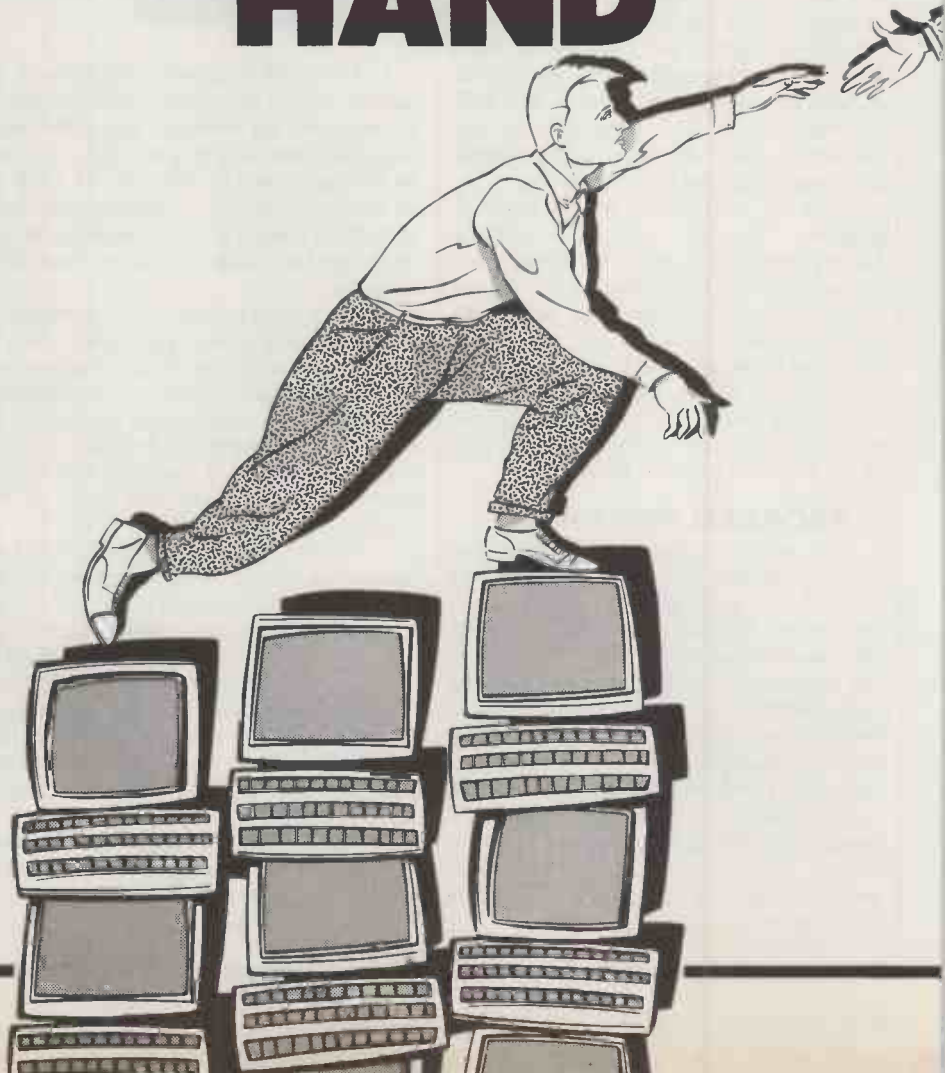
directory and will also help enquirers to select those with the skills they require. This service is available by letter or over the phone. The Institute obviously covers a wider field of management experience than computing alone, but many computer consultants are members.

Once you have decided which consultants to consider it is usual to contact them by letter or phone outlining your requirements. The consultant will then say whether the work falls within their competence, and will indicate a scale of fees. This is normally expressed as a daily rate, with a tentative estimate of the time likely to be spent and expenses likely to be incurred.

It is worth shopping around to compare rates, and you should ask consultants if they have any business connections to a particular brand of equipment or supplier. It is also a good idea to follow up any references that seem to be appropriate. An initial discussion

**Carol Hammond** has been shopping around for advice on buying and installing a micro system.

# A HELPING HAND



## INFORMATION AND ADVICE

**Arthur Andersen** 1 Victoria Square, Birmingham B1 1BD. Telephone: 021-233 2101.

**Arthur Young** Rolls House, 7 Rolls Buildings, Fetter Lane, London EC4A 1NH. Telephone: 01-831 7130.

**Association of Independent Computer Specialists** IPS House, 5 Bridge Avenue, Maidenhead, Berkshire SL6 1RR. Telephone: (0628) 35913.

**Association of Professional Computer Consultants** 109 Baker Street, London W1M 2BH. Telephone: 01-267 7144.

**Binder Hamlyn** 8 St. Bride Street, London EC4A 4DA. Telephone: 01-353 3020.

**British Computer Society** 13 Mansfield Street, London W1M 0BP. Telephone: 01-637 0471.

**Computer Services Association** Hanover House, 73-74 High Holborn, London WC1V 6LE. Tel: 01-405 2171.

**Coopers and Lybrand** Plumtree Court, London EC4A 4HT. Telephone: 01-583 5000.

**Digitus** Lading House, 10-14 Bedford Street, London WC2E 9HE. Telephone: 01-379 6986.

**Institute of Management Consultants** Alfred House, 23-24 Cromwell Place, London SW7 2LG. Telephone: 01-584 7285.

**National Computing Centre** 11 New Fetter Lane, London EC4A 1PU. Telephone: 01-353 0013.

**PERA** Nottingham Road, Melton Mowbray, Leicestershire LE13 0PB. Telephone: (0664) 64133.

**Stoy Hayward** 8 Baker Street, London W1M 1DA. Telephone: 01-486 5888.

with a consultant should clarify what you want done, and it is best if this is written down in case of a subsequent dispute.

Once your job has been placed with a consultant the first step is a feasibility study. The consultant will inspect the job to be done, sometimes asking you to fill in questionnaires. The study will outline how the task can be dealt with in computing terms, or indeed whether a computer is necessary at all. The result is normally a specification describing the equipment and software required, which in the case of a large project is circulated to selected hardware and software suppliers in the form of an invitation to tender. Consultants will sometimes provide support during and after the installation process, including training and recruitment of staff, testing new systems, reviewing and negotiating contracts.

Because computer consultancy embraces two related but different fields there tends to be more than one kind of consultant. On the one hand, consultancy embraces management aspects of problem identification, providing solutions and considering the long-term implications of such action on your business. On the other hand computer consultancy requires a wide range of technical knowledge and skill. The first approach is most likely to be found in traditional management consultancies which have set up specialist groups of computer consultants. The more technical bias is often found in the consultancy departments of established computer service companies. Spanning the two approaches there are independent consultants who freelance in particular areas of the market.

The accountancy firm Arthur Andersen operates the Microguide microcomputer advisory service aimed at small to medium-sized business; Coopers and Lybrand similarly has a Hi-Tech information-technology unit. Stoy Hayward has even launched Computer Helpline through which you can ring up a computer consultant with your computing problem.

The advantage of going to an accountancy firm is that it will be able to advise you about

many areas of your business. Small firms are not turned away; Binder Hamlyn's Information Technology Services division, for example, has many firms with less than 25 staff among its clients.

Systems houses are another source of consultancy services. Such organisations usually have a background in support and training, with obvious benefits to their clients. A systems house often operates on a showroom basis, allowing clients to come in for hands-on experience. Outfits like Digitus tend to think of themselves as the equivalent of a pub free house, with a wide variety of products on offer.

The National Computing Centre (NCC) and the microsystems centres which it runs on behalf of the Department of Trade and Industry are another valuable source of advice. They are not tied to suppliers, so their advice should be unbiased. The centres have workshops where you can test out systems, and they may undertake consultancy sessions as short as one hour, if required.

Though partially government funded, the NCC and its microsystems centres also have to make money by selling their training courses, seminars and consultancy services. Centres are operated on a franchise basis often by universities or polytechnics.

### PAYING THE BILL

Even after you have chosen your consultant and are perfectly happy with the service provided, one final problem remains — paying the bill. Consultancy does not come cheap, with fees generally upwards of £60 an hour.

One of the advantages of buying a micro is that it is relatively cheap, and is simple enough for you to operate yourself. But once you employ a consultant, costs can increase dramatically and an expert becomes interposed between you and the system. Binder Hamlyn probably speaks for many reputable consultants when it says it aims to adopt an educational approach, teaching users how to cope with the aid of a consultant. But for less reputable firms there must be a temptation to keep clients dependent on consultancy services, seminars and so on.

Under certain circumstances you may be able to get a grant to subsidise your consultancy costs. The accountancy firm Arthur Young publishes *Financial Incentives and Assistance for Industry*, which gives details of schemes available to businesses. One grant which has proved very popular is operated by the Production Engineering Research Association for companies with up to 500 employees. It is funded by DTI under the Business and Technical Advisory Services scheme; the DTI will pay for the first two days of consultancy plus 25 percent of consultancy costs over the next 13 days. The problem here is that computing is only one of the topics a client can select to have paid for, and there is currently a backlog of applications. Perhaps after all the quickest and cheapest way of decision making is to do it yourself.

PK



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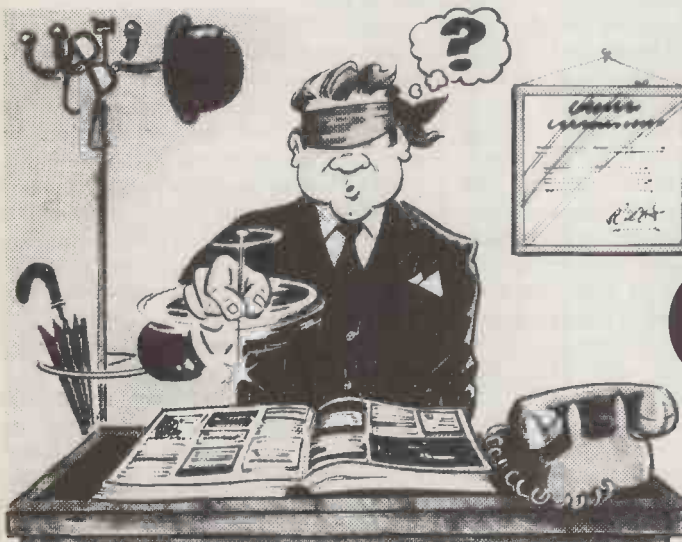
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Readers of the computer press and early purchasers of upgrades for some of the most popular business software packages can hardly fail to have noticed a number of bugs that have appeared in programs over the last year. Some of the major names in the industry, including Lotus, Microsoft and Ashton-Tate, have been forced to produce fixes for their recent programs.

Although some of these problems are more important than others, it is difficult to see how a fault like the loss of data when columns of figures are moved can be missed at the testing stage. In fact, it is hard to escape the conclusion that little or no testing was done. The problems are not caused primarily by the greater size and complexity of programs; they have more to do with the current state of the software market.

Nowadays marketing software is a cut-throat business, with perhaps billions of dollars at stake. The quality of a product is still important to its success, of course, but the timing of its entry into the market is becoming critical.

For a company selling business software there are two peak times of the year. One is at the end of the tax year between March and April; the second is the period from the end of October to the beginning of December. If you want to get your product off to the best possible start it is obviously sensible to launch at the beginning of one of the peak periods.

### INDUSTRY STANDARD

The major driving force behind software development is the notion of an industry standard. To be able to claim that your product is industry standard will generate a virtuous circle for its sales. People will buy the industry standard — and it remains the industry standard because people buy it. If this means releasing a product before it is ready in order to steal a march on the competition, then so be it. Everything depends on getting in first, since once a standard has been set it is almost impossible to dislodge it.

One of the hotly contested sectors of the market has been for the integrated business package. Two of the biggest companies, Lotus and Ashton-Tate, are locked in struggle. Last spring both companies let it be known that they were preparing upgrades of their major packages, 1-2-3 and Framework, which would be ready in time for the November boom.

At the time they were facing increased competition from companies producing clones of their successful products. In particular, Lotus was beginning to be hit by cheap clones of 1-2-3.

But the very nature of software development, often at the leading edge of research, is inimical to working to a set timetable. As a result, software houses may not have time to debug the new products fully.

Yet in the race to stay one step ahead of the clones, companies like Lotus and Ashton-Tate must feel that they are running flat out to stay in the same place. As soon as

a new version of a popular program is released it will immediately be copied by the clones, and the company will find itself back where it started. The trick is to provide regular upgrades with additional features to keep the customers happy and prevent them from defecting to the cheaper opposition.

Another problem that comes with success is that what started as a small company grows into a big one. Small companies are more nimble than larger ones, and can respond more quickly to changed circumstances. For example, the market for languages and utilities appeared moribund until recently; many of the bigger companies had pulled out, leaving the field largely in the hands of Microsoft. But lately, a number of smaller companies have been having considerable success with cheap but powerful products. Recognising the danger, Microsoft decided

## What's bugging you

When you have paid several hundred pounds for the latest package the last thing you expect is that it will crash without warning. Steve Malone explains how you may be gravely disappointed.

it needed a product that would run at similar speeds if it was not to be driven from the market. The result was its hasty launch of QuickBasic.

It is tempting to believe that software publishers might suffer terrible retribution in the market for their misdeeds, but this does not happen. For one thing, it is quite cheap to replace faulty programs. A few weeks after a bug comes to light the software house can deliver patches to every registered user. It can cost as little as £1 per unit to duplicate a new disc and deliver it. As the publisher may already have received several hundred pounds for the product, this is small beer. It also has the beneficial side effect of encouraging users to register in order to qualify for any fixes and upgrades. The pirates get left with the bug-ridden programs.

Sending out free fixes defuses a lot of the ill-feeling that customers might develop. Also, although bugs in major programs gain a lot of publicity, the number of people materially affected is usually quite small. The people who notice bugs are generally those who insist on being first with the latest product or newest version. Unfortunately for

the software houses, they are also the people who complain loudest.

The possibility of damaging rumours beginning to circulate is another factor which puts pressure on software houses to release software before it is ready. If a new package fails to meet its published deadline there is inevitably a lot of gossip about problems the programmers may be having. Not surprisingly, companies are becoming increasingly reticent about launch dates.

The big players in the software market are more concerned with the long view than with short-term glitches in their programs. Bill Gates, founder and chairman of Microsoft, has stated openly that he wants his company to become "the IBM of software". This means not just becoming the market leader, but dominating the entire market so that end-users and other software houses will be forced to follow the standards it sets.

So what can the poor end-user do? If you get sufficiently fed up with inadequate or bug-ridden software you can chuck the whole lot out and start again. But any work you have done with the package will then be lost, and you may very quickly find yourself locked into the upgrade path of your particular manufacturer. The only thing to do then is to avoid the siren calls of sales reps offering to put you one step ahead of the rest. Let the opposition find the bugs while you wait a few months before investing in new software.

Perhaps the best explanation for bugs was given by the marketing manager of a major distribution company who said, "When bugs are discovered, there is a great song and dance about it. But the knowledge of bugs is not reflected in the sales; in fact, it creates more awareness of the product and the publicity generated is at least compensation." So now you know the real reason: any publicity is good publicity. [K]

### RECENT BUGS

The upgraded *Symphony*, launched in the U.S. in July, was found to lose existing data when new data was being inserted or deleted — *Infoworld* 23 September 1985.

Release 1 of *Jazz* was found to crash when fields were cut from a database form — *Practical Computing* September 1985.

The *Symphony* upgrade was reported to lose data if the Copy command is used with the target range enclosing the source range — *Infoworld* 11 November 1985.

Lotus was reported to be working on incompatibility bugs which had appeared in 1-2-3 version 2 — *Infoworld* 3 February 1986.

An announcement that the QuickBasic compiler from Microsoft inserts random characters into compiled programs over 45K — *PC Week* 12 March 1986.

Reports that 1-2-3 version 2 causes printers to seize up when running with *Sidekick* — *PC* April 1986.

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# A BOTCHED JOB

It has been said that those who drafted the current copyright legislation some 30 years ago did not consider that the cassette recorder would ever pose a threat to copyright in records. It was, in their view, a newfangled piece of technology that would never catch on. As the government unveils its proposals for reform of the copyright law, this story may hold deep significance for the computer industry.

For over 10 years governments have fought shy of revising copyright law. Reports have been commissioned, studied and shelved, while the ageing Copyright Act 1956 has limped on, bending and stretching in an attempt to come to terms with the new technology. Eventually a Cabinet Office Discussion Paper called for "a major statement of policy in the intellectual property field". The White Paper *Intellectual Property and Innovation*, Cmnd. 9712, is the government's response.

The objective of intellectual property rights is to reward intellectual endeavour and thus to stimulate the production of original works. The producer's interest in reward conflicts with the public's interest in the free flow of information. Copyright provides the balance: the producer makes his or her work available to the public in return for a fair royalty.

## INTO THE MAINSTREAM

Until recently, copyright was the concern of a few specialists in distinctive and generally capital-intensive industries, notably pharmaceuticals, films, records and publishing. But one consequence of an information-based economy has been that intellectual property rights have begun to affect day-to-day transactions over a much wider area, bringing copyright law into the social and economic mainstream.

The White Paper makes it clear that the provisions of the 1985 Copyright (Computer Software) Amendment Act will be retained. Additionally, the reformed law will refer to "Works fixed in any form from which they can in principle be reproduced". This new form of words covers not only programs but also works first created in machine-readable form for ultimate loading into a computer. However, there are to be no specific provisions in respect of authorship of computer-aided works.

That computer-aided works can attract copyright was affirmed by the High Court last year in a dispute over Express

Does the government's White Paper bring copyright law up to date? **Anne Staines** believes the computer industry may still have cause for concern.

Newspapers' Millionaire of the Month competition. The computer, it was held, was no more than a tool. The author of the work was clearly the person who programmed the computer to produce the work, in the same way that a person writing a work with a pen is the author of the work rather than the pen itself.

This decision demonstrates precisely the problems that are likely to occur in practice. The true analogy with the holder of the pen is the computer operator rather than the programmer; in the Express Newspapers case they were the same person. A third possible claim to copyright could also arise where data originates from a third independent source. This potential minefield, it is true, is one of contract rather than copyright law. The author of a program should consider what rights he or she expects to have in its output when used commercially, and price the product accordingly. However, this can be more difficult than it sounds.

Further problems could occur in cases of joint authorship; the existing law is complex and can create enormous difficulty if one author wishes to grant licences of the work and another does not. In the computer industry there are too many people operating in circumstances likely to give rise to this problem to regard it, as the new proposals appear to do, as insignificant.

International trade adds another dimension to copyright law reform, and one aspect is brought into sharp focus by the new proposals. In order to guarantee legal protection for U.K. products marketed abroad our own laws must grant reciprocal protection to foreign products marketed here. In both Japan and the U.S. special laws have been brought into force recently to protect intellectual property rights in semiconductor products.


There is no proposal for a similar scheme to be introduced in the U.K. It is generally believed that the current copyright law offers reciprocal protection by virtue of its provisions relating to design of functional

objects. However, these provisions have been controversial for a number of years, and the new proposals would alter them to an extent which may affect the reciprocal balance between the U.K. and the U.S., and harm the interests of U.K. companies marketing these products over there. Controversy has raged over two issues: the length of the term of protection given to functional designs, and whether in principle functional objects should be protected by a law that is intended primarily to cover artistic works.

Works of functional design will remain within the sphere of copyright, but it is proposed that the term of protection will be reduced from 50 years to 10 years. This is the same as the term afforded by the U.S. in the Semiconductor Chip Protection Act 1984. However, the term will be subject in the U.K. to the proviso that licences must be granted, where requested, after five years. There is no comparable provision in either American or Japanese law, and it remains to be seen how those governments react to its proposed inclusion in the U.K.

## ENFORCEMENT

Finally, all legal rights depend on effective enforcement. The major grouse over the Copyright Act in recent years has been that it is difficult and costly to enforce. The Act creates both civil and criminal penalties for infringement. The police have been notoriously uninterested in bringing prosecutions. In civil actions defendants have the right to demand strict proof of the plaintiff's copyright, and this can hold up proceedings for years. The effect of the new proposals will be to throw copyright owners back on to their own resources for enforcement.

The requirement of strict proof will not be permitted if this is unreasonable — that is, if the work is obviously the plaintiff's — and this will remove a major disincentive to enforce civil rights in some cases. However, no additional resources will be made available to enforce the criminal provisions of the copyright law. This will disappoint those who had hoped for a greater police and customs commitment to combat international counterfeiting rings. Instead the government advises copyright owners to make greater use of enforcement agencies such as the Federation Against Software Theft. In other words, the industry must pay for law enforcement itself. 



# TELESHOPPING

To be able to order the weekend shopping from your computer keyboard seems like a good idea, but teleshopping services are not taking off as fast as they might. **Carol Hammond** looks for the reasons why.

If Britain is, as the saying goes, a nation of shopkeepers it follows that it must also be a nation of shoppers. Those interested in promoting teleshopping have recognised this potential market and want to turn us into a nation of armchair shoppers.

The attractions of teleshopping are many: no more weekends spent in crowded supermarkets and department stores; more time to devote to your family, your business or your hobbies. All this because you will be able to do your shopping at any time, 24 hours a day, seven days a week.

At least, this is the hopeful scenario painted by teleshopping enthusiasts. In reality it is taking a long time coming.

Services are still fairly limited, and buying a £250 TV adaptor just to use Prestel's services probably seems an expensive way of having your groceries delivered.

The facility for ordering goods over Prestel has been going since 1979, when there was a wine ordering service available. To set up teleshopping services on Prestel you have to rent space at a cost of £6,500 per year for 100 frames, with each additional rental of 100 frames costing £500 a year. Some information providers have a gateway facility into an external computer which houses their own teleshopping software.

The advantage of teleshopping to retailers is obvious: the cost of renting frames is con-

siderably less than that of renting High Street floor space and employing sales staff. But as yet no major department store or chain uses Prestel for teleshopping; Marks and Spencer and J Sainsbury are two that say that they have no plans to at present. One of the reasons for this is the nature of teleshopping, which means that a company has to have its own delivery service to deliver goods within a reasonable period.

This also explains why traditional mail-order firms such as Littlewoods have been quick to use the service. They are already equipped with large warehouses used to switching stocks round fast, and have nationwide delivery down to a fine art. They



also have a ready-made catalogue of products for customers to browse through, and an existing customer base. Where they will benefit is in cutting administration costs and by attracting more customers.

After experimenting with a few hundred products on Prestel, Littlewoods Shop TV extended its range of products last March to 3,500 items. Prestel subscribers receive a free 290-page catalogue illustrating the goods available. Categories include jewellery, car accessories, toys and DIY tools. One noticeable omission is clothing, a mainstay of the mail-order catalogue.

You place an order from Shop TV by keying in the item code number which appears in the catalogue. A message then appears on-screen saying what the item is, its price and how many days to allow for delivery. If your first choice is out of stock an alternative item is recommended. You then order the quantity required. The system displays a running total of how much you have spent.

You can locate the item you want using the product index — say, opting for furnishing and gradually narrowing down the categories until you get the particular curtains you want. Shop TV operates a kind of keyword search facility which allows you to specify an article, a brand and a price range. A list of the products fitting your requirements then appears on-screen. This method allows you to do without the catalogue, but prevents a category as vast and complicated as clothing being included.

### MAIL-ORDER FIRMS

Littlewoods is not the only traditional mail-order firm using Prestel: Gusco, Empire Stores and Kays do too. Kays operates a Personal Selection teleshopping service to reach customers without having to go through an agent. You enter orders using the relevant item code number in the catalogue supplied. Kays is planning a more sophisticated service to start later this year.

Matsuzakaya, the Tokyo equivalent of Harrods, also offers a mail-order service on Prestel. The goods it offers are mainly high-value items, and the service is primarily intended for gift shopping.

There are two grocery services on Prestel at the moment: Club 403 and Teletcard Supershop. Club 403 started in the West Midlands in 1982 as a test project mounted in conjunction with the Department of Trade and Industry. The intention was to provide a news and information service combined with home-banking and home-shopping facilities. The grocery service started in June 1984 with about 1,000 dry products. It was subsequently expanded to offer a service catering for 8,500 items, including bread, meat and vegetables.

Club 403 claims that that of the 1,500-odd registered users in the Birmingham area, about 60 percent use the grocery service regularly. Customers receive a catalogue complete with a product number for each item. The Club 403 display shows what the product is, if it is available, the price, and the running total for your order.



Shop TV uses a keyword search facility so you can select the product you want.

Goods are delivered on the day you specify and at any specified time between 3p.m. and 9p.m. You pay on delivery by cash or cheque.

Teletcard Supershop launched a similar service last February, catering for households in five London boroughs. It should soon cover all London postal districts, and may be extended elsewhere on a franchise basis. With Supershop you can place a regular order, or order up to a month in advance. Teletcard claims that Supershop is attracting 20 to 30 new customers a week.

One of the problems of promoting a teleshopping grocery service is that you have to convince people that they will be getting more than a glorified delivery service for their money. Unlike teletexting, for example, which uses Prestel's facility to provide up-to-date information, teleshopping derives little benefit from the system. It does keep a running total of what you have spent, lets you know when items are out of stock and allows prices of goods to change fast. But you can always ask in a supermarket if it stocks something that is not on the shelves, and quick price changes benefit the vendor more than the shopper.

Although Supershop subscribers get free membership, they still have to furnish for themselves the hardware and software necessary to get on to Prestel. For those without a micro, Teletcard offers a TV adaptor and keypad for £99.95. Residential customers have to pay a quarterly standing charge to Prestel of £6.50, plus time charges of 6p a minute 8a.m. to 6p.m. Monday to Friday and 8a.m. to 1p.m. on Saturdays. These rates are in addition to the ordinary local telephone call charges, which also apply.

### COSTS PROHIBITIVE

Gateshead Social Services department and Bradford City Council both operate teleshopping services for elderly and disabled people in their areas. In the Bradford project, ordering clerks take terminals to customers in their own homes or at day centres. The scheme is run in conjunction with the Manpower Services Commission and is geared towards being labour intensive; the project does not have enough money to supply clients with their own terminals. It is ironic that those who might benefit most from a teleshopping service are likely to be least able to afford it.

At present there are about 30,000 domestic Prestel users, two-thirds of whom use Prestel at some time to order goods. If more residential subscribers are to use Prestel and a facility like teleshopping is to take off with a bang rather than the slow trickle of the moment, either the cost of using Prestel must drop or people have to be convinced they are getting something worthwhile for their money.


A number of teleshopping services also offer adaptors at less than the normal retail price. Prestel is trying to cut costs, and has recently invited tenders for a low-price videotext adaptor. Increasing the number of services Prestel provides and offering a facility where customers could do their shopping and debit their bank account at the same time would encourage more users to join too. However, it is a chicken-and-egg situation where many large retailers are interested in the teleshopping concept but are waiting for more people to go on to Prestel to sell to, who in turn are waiting for more outlets to buy from. Also as more people use it so others become familiar with it, breaking down the techno-fear that is helping to stave off a breakthrough into the residential market.

### THE FRENCH APPROACH

One way of cutting costs would be for Prestel to become more like a free electronic newspaper service, with BT only charging for telephone calls. Another way of solving the problem would be to adopt the French approach, under which every telephone subscriber is to be issued with a free videotext terminal. The French post office, which operates the Teletel videotext network, has issued 1.5 million Minitel dumb terminals to offices and householders. The scheme began in 1981, and the intention is that by 1996 about 30 million terminals will have been installed.

The Teletel system was originally intended to give access to a national electronic telephone directory, but many companies are clamouring to use it to offer other services. Users do not have to register or pay a subscription. Teletel plans to open dial-up ports in London, and will start signing up U.K. users.

British Telecom has no plans to follow the French example, and says that Prestel was launched purely on a commercial basis. A spokesman said BT "did not expect anyone to start giving expensive terminals away" and argued that the French service was only experimental. Perhaps it might have been easier to introduce such a scheme on a national scale had BT not become a privately owned company.

Teleshopping is beginning to take off, but in order for it to progress more rapidly someone will probably have to change their attitude somewhere. It will inevitably arrive, but by then it may be too late as the threat of cable TV may be a real one, and shoppers and retailers may prefer it. The idea of seeing fashion shows on TV rather than leafing through a stale old catalogue will no doubt be more appealing. 

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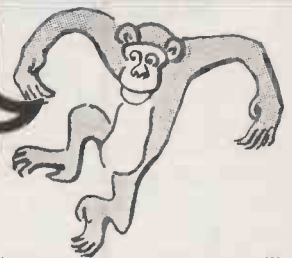
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# INTERVIEW

## GEOFFREY PATTIE

Minister of State for Industry and Information Technology

INTERVIEWED BY STEVE MALONE



**G**eoffrey Pattie has been Minister of State for Industry and Information Technology since September 1984. A barrister by profession, Pattie has been the MP for Chertsey and Walton since February 1974. He has held a number of positions in government since 1979. These have included Secretary of State for the RAF and Minister of State for Defence Procurement.

### How do you see your role as Information Technology minister?

IT'S fundamentally about getting the applications of information technology as widely used as possible. If we're successful, we will dramatically improve the economic activity and the competitiveness of the country.

### Do you see yourself as selling IT or co-ordinating it?

IT'S MORE selling, rather than co-ordinating the implementation. We have to run awareness programmes to get the message across. There are some quite effective ways of doing this. Virtually every economic sector has its trade associations. If we get those and the trade newspapers promulgating the story, people read about it and want to know more.

### Do you have your own computer?

I HAVE a little Sinclair which I got when they first came out. I've twiddled around with that, and I still have it at home. I don't use a word processor or anything like that. I'd like to but I think I'm too far back on the learning curve.

### What are your feelings on the widening IT deficit?

IN 1983 the deficit was 2.1 million then it got to 2.2 in '84 and in '85 it got back to 1.8 and it would seem to us that it's past its peak. Not just from those figures but from other indications that we have. And of course the export performance of the U.K. IT industry has been very impressive. The value of exports has doubled between 1982 and 1985.

I would rather have a deficit for the right reasons than a surplus for the wrong ones. We could easily have a surplus where nobody in Britain was using IT products, but had an IT industry that's saying we have no home market so we'd better do what we can to export. Meanwhile the economic activity of the country in terms of competitiveness and efficiency would be nose-diving.

So, if the sectors are getting the message from the awareness programmes they go out to get the equipment. If they either don't like the British products or they like them but there aren't enough of them or they're not really suitable or there's a queue, they'll suck them in from abroad.

Obviously I can't be relaxed about a deficit indefinitely. What has happened is that although a lot of products were sucked in to begin with, quite a lot of British companies were encouraged to extend their activities and improve their performance through their products. So that has tended, with the export performance, to slow the deficit and now it's started to come down. So I'm reasonably content at the moment.

### Recently there have been complaints, particularly from Alan Sugar, that there is a 17 percent duty on chips and a 4 percent duty on finished goods. Will you be making representations to the EC to reduce the imbalance?

IT'S going to be 14 percent on the first of January, thanks to our efforts. We have to remember that we are only one of the members and the tariffs have got to be agreed community wide. We agree with Alan Sugar. We would like to see the situation where he would have the clearest possible incentive to have the work carried out here. But it is very difficult at the present time because we have to persuade the rest of our partners. The next opportunity for us to do anything about this is going to be the next GATT round in September.

What we would like is if industry would lobby with their opposite numbers in the other European countries, so that a degree of industrial and political consensus can emerge which can percolate up through the government systems in the other countries.

### Do you think there should be some sort of barriers against the import of Far Eastern semiconductors?

SOMETIMES, but I think what has happened is that our technology has improved to the point where, incredibly enough, we can produce quite a few products at lower cost than they can be produced in the Far East. That really is a startling breakthrough because our labour costs are higher than theirs. But if our technology is superior to theirs we can get products produced and assembled here. When that happens you find you are sheltering behind a tariff that no longer makes any sense.

### Can you explain the purpose of the White Paper on copyright protection?

IT COVERS Intellectual Property and Innovation — that's its title — and the second half of it covers copyright. The problem we have is producing a piece of possible legislation which will stand the test of time. That's going to be very difficult in areas of advanced technology, because there are very rapidly moving concepts like artificial intelligence. Is it possible to patent or copyright the outpourings of a machine when no human agency has been involved in creating that product? We're not sure we know the answer to that yet.

One of the pieces of legislation that happened last year was on software theft, which has now passed on to the statute book. I think it was very necessary to get that going ahead of this Bill.

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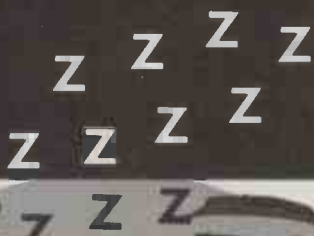
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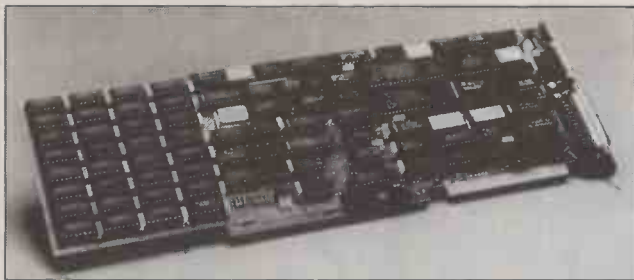
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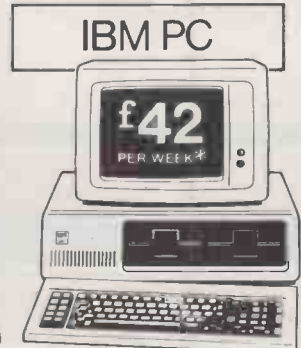
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# TOP 10

As IBM clones all try to emulate the same basic design it can be hard to decide which one to choose. **Glyn Moody** introduces our selection of those which stand out from the rest of the pack.



The big names are still safest.

acceptability of these cut-price machines. Nowadays, many companies large and small are starting to buy clones instead of or as a supplement to the real thing. IBM is seriously worried by this. The sales it is losing are no longer fractions of a percent of the market but significant numbers.

There are signs that IBM is beginning to shed its earlier tolerance. In the U.K. it has had words with clone makers, and in America it has taken action against what it sees as infringements of its BIOS ROM. Doubtless IBM's action against many South-East Asian manufacturers will be even more forceful.

The clone threat is compounded by the entrance of several big names into the market for cheap machines. The Epson PC in particular offers a very low price, acceptable performance, plus the guarantee of an established name. If other Japanese micro makers also enter this arena with their full panoply of advanced manufacturing techniques the price could drop even further. It is probably only the strength of the yen which is stopping them.

To a certain extent IBM has pre-empted this approach by dropping the price of the PC models, and by introducing the 3.5in. discs via the Convertible. By shifting the standard it probably hopes to pull the rug away from under the clone makers' feet. However, in the process it might well create

A paradox lies at the heart of this month's top 10. For a machine to make it into the list, it needs to be as compatible as copyright laws will allow. Yet machines which set out to imitate a basic design are doomed to be almost indistinguishable. So how do you decide which machine to choose?

Of course this is precisely the problem which manufacturers of IBMulators face. By producing a me-too machine, they inevitably prompt the question "Why you?" In response to this dilemma, a number of strategies have evolved and they form the basis of this selection.

Historically, the first solution was added value: providing everything IBM does and more. When Compaq produced the first compatible it also plugged a gap in IBM's range. The first Compaq was a bulky transportable that gave you all the power of Big Blue's machine plus a handle. In fact it gave rather more than that. When IBM belatedly launched its own transportable, it failed to make much headway against the firmly established Compaq version. Following the announcement of the Convertible, the IBM Portable is to be quietly dropped.

With the M-24, Olivetti came up with its own version of how to go one better. It produced a machine which was a good bit faster. Once again the market responded favourably to this approach and about 400,000 M-24s in one form or another have been sold.

Once these two manufacturers had shown the way, many others joined in. For some this represented a considerable loss of corporate face as they conceded the unstopability of the IBM standard. But rather than challenge the market with startling technology or pricing, they were mostly content to offer clones which could be sold by their sales forces alongside larger kit.

## PIONEERS

The moves of the early clone makers did two things. First they established that people were prepared to buy IBMulators instead of the real thing. Secondly, and more importantly, they showed that IBM was prepared to let them do so. This probably had more to do with U.S. politics than with any radical upsurge in unanimity at IBM.

IBM is just too successful. If it really tried it could probably take out all the opposition everywhere by selling for less than cost price for a few years. However, anti-trust laws in the U.S. are designed to prevent this abuse of monopoly. Hence IBM was content to suffer a few pinpricks from the clone makers for the sake of appearances. In any case, to begin with it was selling PCs as fast as it could make them, so there was need to drop the price to stimulate demand.

But things have changed. The new wave of clones do not come from fellow U.S. companies but from South-East Asia. These IBMulators typically cost half of Big Blue's list price and the gulf is widening.

Price on its own would pose little threat to IBM; equally important is the greater


problems for itself since it too is tied to the PC standard.

The same is true of the AT market. As yet there is no software written specifically for the AT as distinct from the PC. In effect, the AT is just a faster, upmarket version with a bigger hard disc. If IBM had hoped to keep the price-cutting hordes out of this area for a while, it has been disappointed. Already Tandy and Tandon offer AT clones about 40 percent less than the IBM list price. Other machines have been or are about to be launched. As with the PC, a few manufacturers have gone for the added-value approach with the AT too, notably Compaq. But increasingly price is becoming the main issue.

## PRICES SET TO FALL

In the next few months we are certain to see yet more price cuts both from IBM, which looks set to become increasingly aggressive, and from the clone makers. Already clones are available for around £500; prices of £400 and even £300 do not look impossible. If and when the fabled Amstrad PC turns up it is likely to fit in this area, possibly with a printer thrown in too. However, Alan Sugar would be crazy to launch it just yet, since it is bound to eat into sales of the PCW-8256, which is currently selling like hot cakes.

Ultimately, buying a PC comes down to deciding whether price is all-important. If it is and you are prepared to accept the attendant risks of buying ultracheap — see the article on clone makers in the June issue of *Practical Computing* — IBMulators really are much the same. But if you go for the added-value approach or your budget can stretch to the next tier of clones, the machines on the next two pages will give an idea of the options available.

The standard PC entry-level machine has 256K RAM; two 360K floppies, a keyboard and a monitor. The normal processor is an 8088, but some use an 8086. The standard AT has a 20Mbyte hard disc, a 1.2Mbyte floppy, keyboard, monitor and 80286 processor. 

## SUPPLIERS

**Compaq Computer** Ambassador House, Paradise Road, Richmond, Surrey TW9 1SQ. Telephone: 01-940 8860.

**Epson (U.K.)** Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH. Telephone: 01-902 8892.

**Future Management Systems** 38 Tanners Drive, Blakelands North, Milton Keynes, Buckinghamshire MK14 5LL. Telephone: (0908) 615274.

**Mitsubishi Electric (U.K.)** Hertford Place, Maple Cross, Rickmansworth, Hertfordshire WD3 2BJ. Telephone: (0923) 770000.

**Olivetti (U.K.)** Olivetti House, PO Box 89, 86-88 Upper Richmond Road, London SW15 2UR. Telephone: 01-785 6666.

**Tandy** Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA. Telephone: (0922) 648181.



## EPSON PC

**£1,047**

Epson dropped a bombshell with the launch of its PC. Hitherto clones had been either cheap and nasty or else from a large company but with a price tag nearer that of IBM. The Epson PC offered a good price plus the backing of a big organisation; it seemed almost too good to be true. There are one or two drawbacks, limited expansion capability in particular: once you have installed a graphics card there are only two slots left. The performance is also nothing to write home about. But it is a compact machine, offering full compatibility, and there are good display options available.

**FOR** Price. Solid name.

**AGAINST** Limited expansion. Lethargic disc performance.



## OLIVETTI M-22

**around £1,600**

As the IBMulator market has saturated and technology has moved on, many manufacturers have tried to produce portable equivalents of the PC. Compaq was the first to move in this direction with its transportable, but its machine was little more than a desk-top with a handle on it, and used a conventional display. Later machines have used alternative display technologies — the Sharp PC-7000 with its LCD and the Panasonic JB-3300 with a plasma display are two examples. The most recent of these attempts, and perhaps the most successful, is Olivetti's M-22. It uses a back-lit LCD to give a legible display and, unlike most other machines, it is genuinely portable. Its main deficiency is the limited expansion it offers.

**FOR** Battery portable. Good LCD.

**AGAINST** Limited expansion. Badly-designed keyboard.



## OLIVETTI M-24

**£1,910**

The Olivetti M-24 was one of the first PC clones to hit the market. It turned in a Benchmark performance almost twice as good as the IBM PC, showing just how underpowered the original machine was. The Olivetti's superiority has been reflected in its sales, which have taken it to one of the top positions in the clone league. Today it is probably the most established of the clones, along with Compaq's transportable. Olivetti also offers the backing of a European company that seems to be able to do no wrong. In addition to the basic M-24 there is the even faster M-24SP.

**FOR** Performance. Solid name.

**AGAINST** Venerable design. Cheaper clones available.



## TANDY 1000

**£1,195**

The Tandy 1000 is a slightly curious machine. It comes with colour graphics as standard but does not allow you to use an ordinary monochrome text-only display. Perversely, the slots on the machine are not full-length, so many IBM cards will not fit. However, against these quirks there is some useful bundled software in the form of Deskmate, an integrated package. The applications included are a word processor, a spreadsheet, a filing program, a comms program and an appointments diary with built-in alarm. Despite its idiosyncrasies, the Tandy 1000 emerges as a neat total solution.

**FOR** Bundled software. Colour as standard.

**AGAINST** Limited expansion capability. Non-IBM keyboard.



## PC clones

**from £500**

The common provenance of many of their components and the small-scale nature of the companies that build them make it necessary to look at these machines as a class, rather than individually. Clones represent a quite different approach to buying a micro, with the PC being sold as a straightforward consumer product like cards or cameras. When buying a cheap clone you should bear in mind that there will be little support forthcoming, and that these companies come and go with distressing frequency. Only really a solution if you know what you are doing. For names and addresses of U.K. clone makers see the article on page 76 of last month's *Practical Computing*.

**FOR** Huge cost savings.

**AGAINST** Little-known, often unstable companies.





**COMPAQ DESKPRO 286**

**£4,395**

The Deskpro 286, from the first manufacturer of IBM compatibles, features the same quality engineering and rugged design that characterised earlier Compaq computers. The Deskpro 286 began the trend towards running AT clones at an 8MHz clock speed, which has only belatedly been followed by IBM. At the same time the Deskpro 286 is capable of running more PC software than IBM's own AT. The computer is fitted with the standard AT features and has a 30Mbyte hard disc and 512Mbyte RAM, expandable to 8.2Mbyte. Like other members of the Compaq range the computer is available as a desk-top or a transportable.

**FOR** Well engineered. Excellent compatibility.

**AGAINST** Expensive compared with some.



**MITSUBISHI 816F**

**£3,400**

Although it has been a late arrival in the personal-computer market, it would be wrong to disregard a company with the worldwide clout of Mitsubishi. The company has an established reputation for producing high-quality monitors and disc drives but has only recently launched a micro under its own name. The AT-compatible 816F is unusual in running at 4.77MHz and 7.16MHz instead of the more usual 6MHz and 8MHz. It is fitted with 512K of RAM, expandable to 5Mbyte. Although not the cheapest machine in its class, this AT clone is still reasonably priced and has a colour monitor and 40Mbyte hard disc fitted as standard.

**FOR** Quality machine. Company wants to impress.

**AGAINST** Unusual clock speeds. No direct dealer support.



**OLIVETTI M-28**

**£3,666**

Olivetti enjoyed a great deal of success with the M-24 and obviously hopes to follow suit with the M-28 AT clone. Like the Compaq, it is equipped with 512K of RAM on the motherboard, expandable to 1Mbyte; using the expansion slots the maximum memory is 7Mbyte. Unlike some other AT clones, the Olivetti machine also includes a colour controller in the base model. The M-28 is considerably smaller than other AT emulators and will fit comfortably on the average desk. The keyboard feels a little strange at first, but you quickly begin to appreciate it.

**FOR** Well designed and well built. Manufacturer has good reputation.

**AGAINST** Rather expensive.



**SPIRIT AT**

**£2,495**

If it is value for money you are looking for, then the Spirit AT from Future Management Systems could be for you. The standard model is a complete ready-to-work system with a monochrome monitor, serial and parallel ports, graphics card and Microsoft Windows, all for under £2,500. As if that were not enough Future has also bundled the Integrated 7 package, containing all the standard business applications including spreadsheet, graphics, terminal emulation and data-mail. A bargain like this ought to make the bigger manufacturers squirm with embarrassment.

**FOR** Great value for money.

**AGAINST** Little-known manufacturer.



**TANDY 3000**

**£2,795**

Though priced at under £3,000, the Tandy 3000 contains most of the standard AT features with the exception of a graphics board. It is fitted with 512K of RAM expandable to 640K, and follows IBM in housing the computer in a large chunky case which will cover a large proportion of your desk. The Tandy does not attempt to wildly outperform the PC/AT, although it runs considerably faster than the old 6MHz version of the IBM machine.

**FOR** Low price. Established manufacturer.

**AGAINST** Nothing special offered. Unfashionably large.

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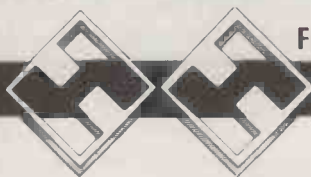


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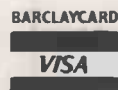


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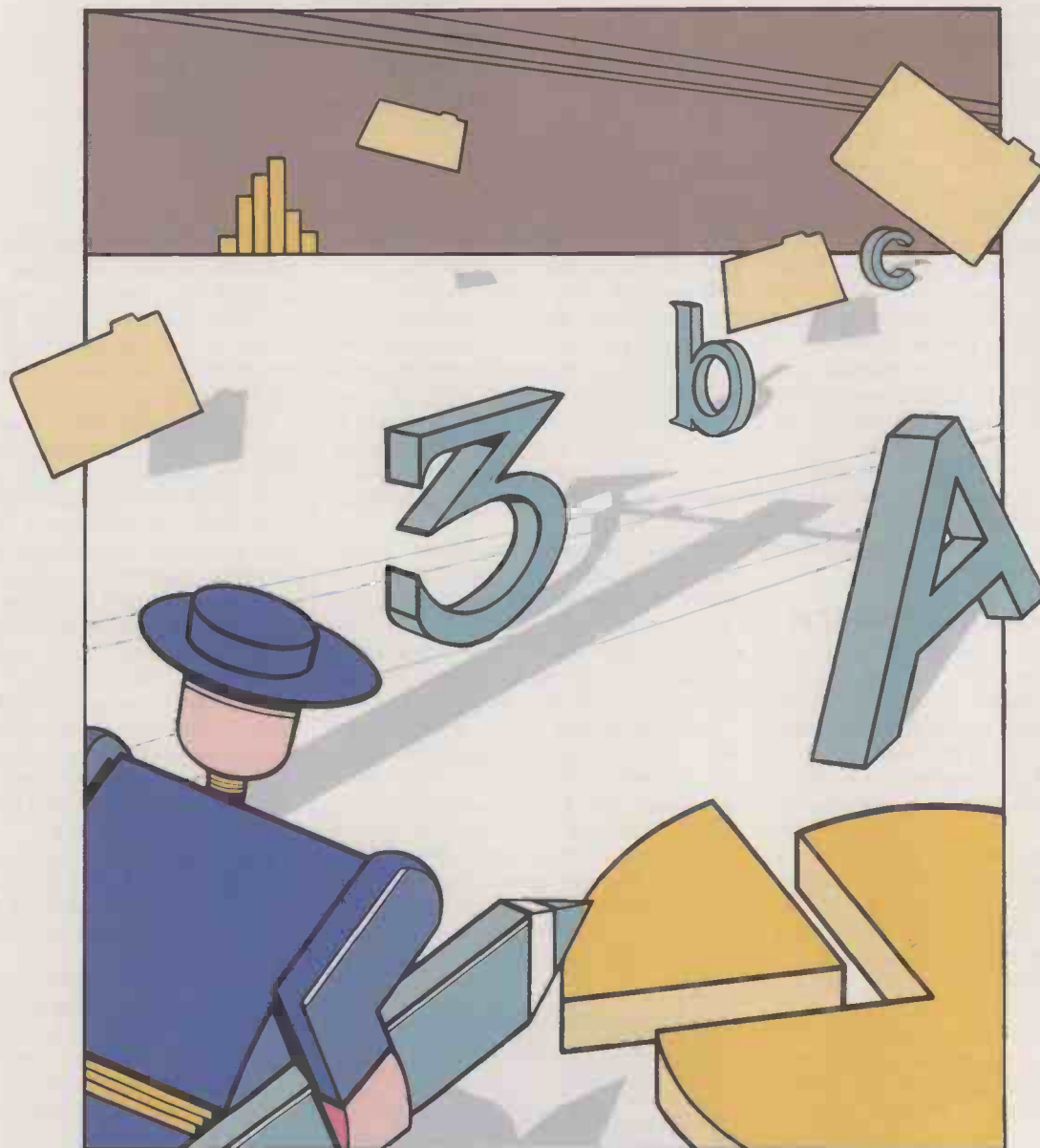
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# Integrated

## SOFTWARE

The giant programs of a couple of years ago are no longer in favour, but software integration remains as important as ever.

**Ian Stobie** outlines the current trends.



## PULLING TOGETHER

**M**any of today's most popular business software packages are integrated. Suppliers no longer necessarily make a lot of fuss about it as integration is now commonplace.

The reason for integration is fairly obvious. People often want to use the same data in several different ways. For example, you might work out a detailed sales projection with a spreadsheet and then want to use the figures in a word-processed report, either as a straightforward table or perhaps transformed into a chart. Using separate software packages for each step this might be possible, but it would probably be difficult to achieve.

Integrated software is designed from the outset for this sort of thing. It should allow you to move data easily between applications, and it should also be easier to use than a collection of unrelated products as the commands used in each task may well be similar.

But different software suppliers have adopted different approaches to integration. In this special 12-page section we compare the benefits of the different

(continued on next page)

(continued from previous page)

kinds of integrated software on the market, and we review examples of the latest products in each category.

The classic approach to integration is to combine all the major business tasks such as spreadsheet, word processor and database into the same program. This results in a large and fairly complicated product if you try to get a full set of features in each task. The best-known package of this type is probably Lotus Symphony.

However, this approach has come in for heavy criticism on the grounds that such gargantuan all-in-one programs take a long time to learn and make extremely heavy demands on memory and disc space.

On this page we consider whether such criticisms are justified. Glyn Moody reviews the new U.K. version of Enable, an ambitious all-in-one program of the Symphony type for the IBM PC. Enable has recently won a large and highly coveted U.S. government contract to supply the Internal Revenue Service, so clearly the all-in-one package is by no means dead.

### THE MODULAR APPROACH

But most software developers have now abandoned the all-in-one approach, especially for their top-end products. Modular integration is what they go for now. Here each major task is performed by a separate package, but the individual packages are designed from the outset to work with each other.

This allows the developer greater scope in each application, as limitations of memory and disc space are not so pressing. The user should still get the advantages of easy data transfer and a consistent command set.

Modular integration is popular both for relatively simple products like the excellent PFS series and for very ambitious ones such as Open Access or Smart. But it makes particular sense at the top end of the market, where a spreadsheet or database aimed at power users may require the full resources of the machine. On page 94 Steve Malone reviews the latest version of Smart, a modular family of programs for the IBM PC.

Yet the all-in-one integrated approach has not been entirely abandoned. Instead it has tended to shift towards products at the easy end of the market. Here the disadvantages are less severe as the occasional or first-time user is not looking for ultra-powerful software incorporating every conceivable feature.

On page 98 Ian Stobie previews Microsoft Works, a new all-in-one product for the Macintosh. Works is above all designed to be easy to use, even at the expense of leaving out features you would expect to find on a single-task power package.

Finally, on page 101 we look at the growing trend towards do-it-yourself integration. Mike Lewis examines how far users themselves can go with products like Windows and Sidekick to get the benefits of integration from non-integrated packages. Is this the way things will go in the future?

Big can be beautiful if you happen to want what an all-in-one package offers. **Glyn Moody** tackles one of the latest examples of the genre.

## ENABLE

**E**nable is something of a dinosaur among software packages. Its philosophy of doing it all in one belongs to the heady early days of business micro-computing when the natural solution to new problems was to write ever bigger programs with yet more functionality. In Enable's case sheer size may also be a product of its pedigree: the author of the program, The Software Group, is better known as a systems house working in the mainframe and mini sectors.

Perhaps the apotheosis of this heavy-weight approach is Framework II. Enable differs from Framework in keeping each function distinct though not totally separate. This contrasts with Framework's unitary approach, where all functions are just aspects of the basic frame idea.

As other articles in this special section show, the sledgehammer approach is now out of fashion. But it does have some advantages, and Enable exemplifies them well. In addition to a relatively unified command structure among the five modules of word processor, spreadsheet, database, graphics and comms, there is a ready ability to swap data between applications, and the ability to open several applications simul-

taneously. For the power user these are all valuable features. The down side is that horrendously complicated command strings are often needed to invoke the enormous range of features with which a monster program such as Enable is endowed. It is not for the beginner.

As you might expect, Enable is huge. Ignoring for the moment various overlay files, the main section of the program is a solid chunk of 330K. Surprisingly, you only need 256K of RAM to run it, though if you wish to run the spreadsheet and database functions together you need 320K. This economy is achieved by the use of program overlays. The more RAM you have, the less the program needs to use overlays and the faster it runs. The package costs £646.

The installation process did not augur well. It took me about half an hour of fiddling around with some of the five discs the program comes on. Even running it proved problematic. Instead of just typing

ENABLE

as you might expect, you may have to specify a range of default options. In the end it turned out that to run the system from hard disc the required command was

ENABLE (,,,C:)

Once you are in Enable things become considerably easier. The whole system is menu-driven, and it is possible to bypass tedious journeys through the menus by using the function keys, often in conjunction with Alt. The opening menu allows you to use the various modules, quit, or use the Master Control Module (MCM).

### MCM BINDS SYSTEM

The MCM, which is also available from within the application modules, is the glue which binds together the disparate elements of the system. It provides Enable's most impressive features, one of which is windows. You can open up to eight windows at a time, and each one may fill the whole screen or only part of it. You use the cursor keys to squash or expand the windows to the size you want and to move them to the required position. Pressing Alt with the Up or Down cursor key moves you through the numbered windows in sequence. You can open a DOS window without leaving the application. This powerful feature allows you to list directories or even run programs. To use the DOS facility you have to allocate some space for it in the start-up sequence.

Information can be copied from any window to any other. Function keys play a crucial role in this, as they do in many other



Enable is entirely menu driven.

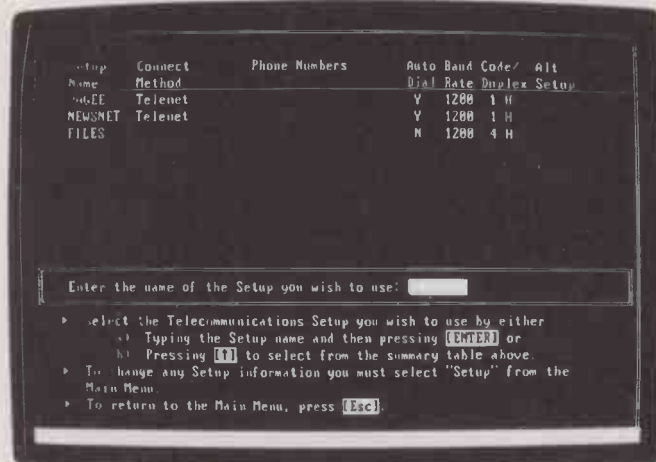
### SPECIFICATION

**Description:** integrated package with word processor, spreadsheet, database, graphics and comms  
**Hardware required:** IBM PC, PC/AT or compatible with 256K RAM; 320K RAM needed if spreadsheet and database are used simultaneously  
**Copy protection:** none  
**Price:** £646  
**Publisher:** The Software Group, Northway Ten Executive Park, Ballston Lake, NY 12019  
**U.K. supplier:** First Software, Intec-1, Wade Road, Basingstoke, Hampshire RG24 0NE. Telephone: (0256) 463344  
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# Integrated SOFTWARE



Above: Control characters signal type styles on-screen.  
Below: You can specify Setups to hold comms parameters for commonly used services.



parts of the program. The sequence of actions required is often rather opaque, as the following procedure shows. To copy data you first move the cursor to the location in the window where you want data copied. Then you press Alt-f5; this moves you to the so-called Window Status screen, which displays the open windows by number. Pressing the number of the window from which data is to be transferred takes you to that window. You then mark the data to be moved by placing the cursor at the start, pressing f7, moving the cursor to the end of the block and pressing f7 again. Then pressing Alt-f5 again will implement the transfer.

Macros form another powerful feature of Enable, also controlled from the MCM. They are familiar enough from spreadsheet work, but Enable's big advance is to allow you to use them in any application. Each macro is assigned to a single keystroke in the usual way, but is defined relative to the application which is open in a particular window. Thus you can define a different macro for the Z key, for example, for each application. You can record macros as you go along or build them up as a text file. The macro commands used in Enable are very similar to those 1-2-3.

The final feature controlled from the MCM is the ability to customise menus.

Again this is not something which a beginner should lightly contemplate. I also doubt whether many advanced users are really going to need to use such facilities, except perhaps as a time-saver. But there is no denying that it is a powerful extension of the features previously found in integrated packages.

Perhaps the most interesting of Enable's application modules is the word processor. After all, a spreadsheet is a spreadsheet, but there are many different approaches to text manipulation. In character with the rest of the package, the word processor attempts to do practically everything. For example, in addition to all the standard headers and footers, it offers you a separate title page as well as rulers which can be inserted at any point.

## COMPLEX COMMANDS

Commands may be invoked using the function keys or from the menu bar along the top, which causes further menus to drop down. Enable provides a daunting reference card with all the assignments for each function key in each application. Some of them are Byzantine in their complexity: for example, to insert a paper clip — Enable's name for a text marker — you press f9 followed by Ins then M then C.

A range of text enhancements are possible



Above: Enable's spreadsheet looks similar to Lotus 1-2-3.  
Below: Windows can be changed in size and shape, and moved around to the required position.



and there is a help menu if you need it, giving the keystrokes required. Some of the enhancements show up on-screen while others are signalled by control characters. Other notable features include the ability to create footnotes, a table of contents and even an index. Unfortunately the commands required to set up an index are confusing and the on-screen appearance is unhelpful, but these facilities will still be very useful for heavy-duty work.

As you might expect from an integrated package, it is possible to use a calculator feature from within a document. Even more important is the mail-merge facility, which allows you to draw on the full power of the database and thus provides many more facilities than are available in a normal word processor's mail merge.

Invoking the MCM from within the word processor brings up the main on-screen menu. Here you can view the word count, line count and date and time the document was created. Documents can be saved in several formats, including WordStar. The only limit on size is the disc space available. At print time the page forms give you detailed control over the final appearance of your copy.

The word processor emerges as a powerful full-feature program. Although it goes very

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much its own way, it will meet most people's needs. About the only major omission is the ability to produce multi-column output, though this may be rectified in the future.

The database is far more conventional, being closely modelled on Ashton-Tate's dBase III in its approach. It can support up to 65,000 records with up to 254 fields containing up to 254 characters. On top of this basic structure Enable has added its menu-driven mode of operation and the ability to import data from other parts of the package. The main route for commands is the top-line menu with its pull-down options; function keys are used relatively little. Macros could turn out to be a real boon here, allowing long strings of commands to be replaced by a single keystroke. As well as a full range of system commands there are also the usual dot commands which make up the report language.

Given the close similarities between Enable's database and dBase III it is no surprise to find that data may be exchanged

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

A powerful all-in-one tool — but only for the expert.

between the two. More interesting is the ability to import data from both the Enable spreadsheet and from 1-2-3 files. The spreadsheet layout is used as the basis for converting rows and columns into fields.

The spreadsheet itself is a close clone of 1-2-3, and anyone who knows the Lotus product will be able to use it without difficulty. Although this familiarity has obvious advantages, it also means that you lose much of the common command structure across the different modules of the integrated system. The worksheet capacity is around 65,000 cells: up to 500 rows by 127 columns or 4,000 rows by 15 columns. As in 1-2-3, the graphics are closely bound up with the spreadsheet, though here they are an integral part of it rather than a separate program. The usual range of graphing options and formats are available.

The final element of the integrated package is communications. The basic approach is to use preset groups of parameters, with a menu-driven user interface to take away all the messy fiddling that using comms normally entails. To set up the presets you simply go through screens of prompts, inputting the correct values for such parameters as baud rate, parity and so

on for each service. A connection to electronic mail, an on-line database or even another micro is effected by selecting the name assigned to the relevant parameters.

Having comms as part of an integrated system makes it particularly easy to capture data and manipulate it. Enable lets you capture data straight to disc, or you can edit it with the word processor first. The comms unit should work with any Hayes-compatible modem, though we were not able to test this.

Enable comes with six manuals: one for each of the applications plus *Getting Started* and a system overview. *Getting Started* is not very clear, and would be daunting for a beginner. The application-specific manuals are comprehensive, but I found their layout confusing. This is partly the result of a worthy attempt to impose a set of conventions regarding typefaces: bold for keys to be pressed, capitals for menu options, and so on. Unfortunately the end result is a messy layout that does not help you find your way to the information you require. With a package as complex as Enable this is more of a disadvantage than usual.

There is no doubt that Enable is an impressive piece of programming. Within its admittedly extensive bounds it packs a lot of software punch. But the question remains whether this is necessarily the best way to tackle things.

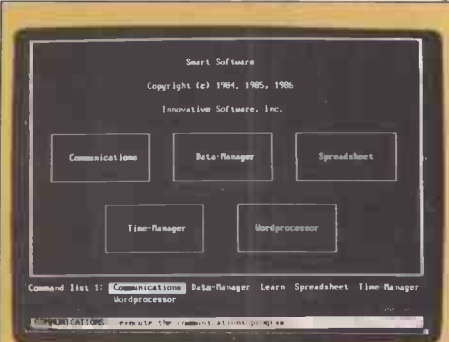
## DAUNTING SIZE

Clearly the program will be of most value to people who want all five applications and who are likely to want to transfer data between them. Although the £646 asking price seems steep at first sight it is only just over £100 per application, including modules very close to 1-2-3 and dBase. The danger with such a comprehensive package is that its sheer size and complexity may deter people from using any of it. This makes it particularly unfortunate that the manuals are not better.

Enable will probably appeal most to the power users who will revel in the full range of functionality it offers. Its considerable scope for customisation may also appeal. It does, however, lack the consistency and rigour of Framework, which offers the same kind of functionality within a far neater overall design. But to balance that disadvantage it is more closely compatible with standard packages like 1-2-3 and dBase III. This factor makes it an attractive option for organisations where these packages are already standard.

## CONCLUSIONS

- Enable is a multi-function integrated package which offers a word processor, spreadsheet, database, comms and graphics.
- It offers advanced features in most of its applications and a powerful windowing and macro facility which extends across them all.
- Partly as a result of this power, the program is not at all straightforward to use; the command structures are particularly complex.
- Enable is best thought of as the ultimate package for power users.



The standard Smart command format begins on the opening screen.

## SPECIFICATION

**Description:** integrated suite containing word processor, spreadsheet, database, comms and diary

**Hardware required:** IBM PC, PC/AT or compatibles with 256K RAM; DG One; Apricot XI with 384K and double-sided drive

**Copy protection:** none

**Price:** complete system £695, Smart Word Processor £295, Smart Spreadsheet and Smart Database £395 each; systems disc and communications/time-manager bundled with each module

**Publisher:** Innovative Software, Southampton House, 192 York Road, London SW11 3SA. Telephone: 01-223 3876

**U.K. distributors:** Softsel, Softsel House, Syon Gateway, Great West Road, Brentford, Middlesex TW8 9DD; telephone 01-558 8866. First Software, Intec-1, Wade Road, Basingstoke, Hampshire RG24 0NE; telephone (0256) 463344. Paradigm Ltd, Southampton House, 192 York Road, London SW11 3SA; telephone 01-228 5008

**Available:** now

The Smart System from Innovative Software is published as an integrated set or as three separate modules: the Smart Word Processor, the Smart Spreadsheet and the Smart Data Manager. Version 1 appeared in August 1984. We reviewed the newly released version 3.0 running on Olivetti's AT-alike, the M-28.

One of the problems with buying a complete set of modules that might normally be sold individually is that you end up with more discs than you would otherwise need. The complete Smart System, together with the spelling checker and printer fonts comes to a total of 12 discs. Although it is possible to get along with such a large number of floppies, the continual disc swapping that is necessary is a persuasive argument for investing in a hard disc. Innovative software has not placed any copy protection on the discs, so installation is simply a matter of typing.

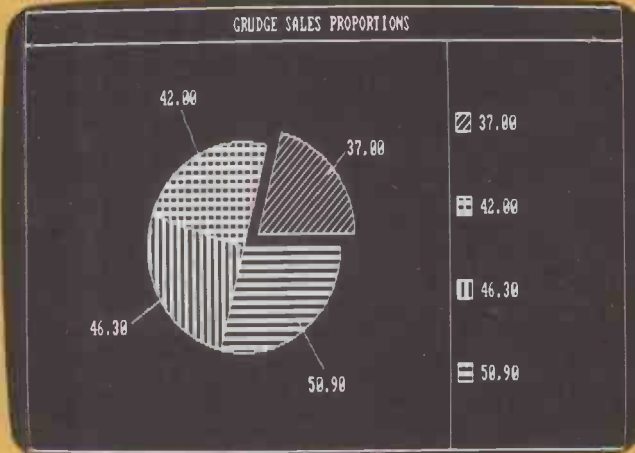
### INSTALL

and configuring the software to your monitor and printer.

Although each program within the Smart system can be used independently of the rest, they have been written with integration in mind. Their format and layout have therefore been made as uniform as possible.

1	2	3	4
19	LIABILITIES AND EQUITY		
20	Current Liabilities:		
21	Accounts Payable	7,100	5,200
22	Accrued Expenses	1,600	1,700
23	Accrued Taxes	500	400
24	Total Current Liab.	\$9,200	\$7,300
25	Mortgage Bonds Payable	16,100	16,000
26	Total Liabilities	\$25,300	\$23,300
27	Stockholders Equity:		
29	Preferred stock (\$100 par)	1,600	1,600
30	Common stock (\$10 par)	2,007	2,000
31	Additional Paid-in Capital	1,000	1,000
32	Retained Income	1,200	1,100
33	Total Stockholders Equity	\$5,807	\$5,700
34			
35	Total Liabilities and Equity	\$31,107	\$29,000
36			

Command list 4: Activate Directory File Index Load Matrix Password Read Save Unload Write  
Worksheet: BALANCE Loc: r36c1 FN: Font: Standard  
LOAD - load a worksheet into the current window



Above: The spreadsheet can hold up to 999 columns and 9,999 rows, and up to 99 characters per cell.

Below: You can paste graphics into Smart WP documents.

Above: A wide range of graphing options is available as an integral part of the spreadsheet module.

Below: The Smart Comms module, showing defaults.

Window 1

past twelve months. As you can see, Widgets have increased their share of our overall sales, mostly at the expense of Ungents.¶

Whether this means that we shall have to rethink our strategy on the marketing of Ungents, or even consider pulling out of the market altogether is something we ought to discuss at the next management meeting.¶

Please tell me if you have any further questions regarding this situation, and I'll do my best to answer them.¶

C:\SMART\FRED1.scn

F1 Help F3 Find F5 Replace F7 Zoom F9 Repeat  
F2 Next menu F4 Goto F6 Font Select F8 Execute F10 Quit  
Document: SALES Pg:1 Ln:2 Ps:5 FN:0 Font: Standard Insert ON  
TEXT-ENTRY - normal text-entry mode

Originate Mode

Name: Smart Default settings  
Number: -- None --

Modem Parameters		Settings	
Modem:	1	Capture Filter:	Off
Port:	Serial-1	Terminal Filter:	Off
Speed:	300	Keyboard:	None
Data-length:	8	Emulation:	None
Parity:	None	Attention Key:	Escape
Stop-bits:	1	Switch Key:	F3
Duplex:	Full	Break Key:	Alt+B

Command list 1: Answer Capture Dial Hangup Receive Settings Transmit  
Capture: None Null  
ANSWER - answer phone after waiting for it to ring

Steve Malone tests a closely integrated family of programs which covers the standard business applications.

## THE SMART SYSTEM

Booting the system disc displays an opening screen in the standard layout for the Smart System. The application is displayed within a window at the top of the screen with a separate command box in the bottom four lines. This command box is divided into three parts: the top two lines contain a menu of some of the available commands; the third line provides status information such as the current file name and position within the file; and the bottom line contains help information in the form of a brief explanation of the command currently highlighted in the menu.

Commands can be executed either directly or through a series of menus. You can page through the range of menus available in the command box by pressing f2. Once you have reached the menu you want, you select the required command by

moving the highlighting cursor to the appropriate position and pressing Enter. Alternatively you can just key the initial letter of the command you require.

This system is fine for beginners, but once you are familiar with the package it becomes tedious to have to work through several menu levels to reach the command you want. The program caters for more experienced users by providing a more direct method of accessing commands. Commands such as Help or Quit, which are not specific to a particular application, are held on the 10 function keys. These commands remain more or less the same no matter what application is being run.

Other commands can be executed by pressing Alt or Ctrl in combination with another key. These commands are more application-specific than the function keys.

For example, in the word processor the Ctrl combinations execute commands in text-entry mode, such as setting margins or typing in bold. The Alt combinations control quick cursor movement and editing, such as Load, Copy, Page Break, etc. The less frequently used commands are kept on separate command menus which you access by pressing Escape and paging through the menus until the required command is found. It can then be highlighted and executed in the same way as the quick commands.

A particularly thoughtful feature included in the Smart System is the concept of confidence levels. The idea is that novice users may not wish to become involved in some of the more sophisticated aspects of the software until they are familiar with the basics. At the lower confidence levels users are shielded from those features. Refinements which appear only at higher confidence levels include a keyboard macro facility that allows commonly used procedures to be incorporated into a single key press. Macros can include text, existing commands, and even other macros.

Along with the systems program, which is required to run any of the applications,

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there is a communications program and a time manager. The comms package allows data from each of the modules to be received and transmitted via a modem. It supports Hayes protocols and can work in Xmodem and auto-answer modes. The time manager contains a diary and a memo pad to list tasks and appointments.

The standard Smart layout gives the word processor something of the appearance of Microsoft Word. Smart even has an end-of-text diamond and a similar on-screen ruler, although it is at the bottom of the window rather than the top. The text window itself is 18 rows deep and 80 columns wide.

The Smart Word Processor is generally well up to current standards for WP software. It implements automatic formatting of paragraphs, it creates headers and footnotes, and will automatically save a document that is too big to fit in the memory. Another useful feature that is becoming popular is an on-screen calculator which allows you to do arithmetic without leaving the application.

The word processor has 11 built-in fonts, ranging from Gothic to Greek. Given a suitable monitor they appear on-screen. Monochrome monitors cannot display fonts but simply display the text in a different shade to indicate the font's presence. Smart also allows you to create fonts of your own.

Like other modules in the Smart range,

the word processor is able to read non-ASCII files from other programs in its field. Thus Smart Word Processor can read and edit WordStar files through its Foreign File interface. It must be galling for a software house to have to do this kind of thing, though it is becoming increasingly common practice.

The spelling checker operates on whole documents, paragraphs or single words. Unfortunately it is not fully anglicised, and would not accept "recognise", for example. You may well have to spend some time customising the dictionary before it performs satisfactorily.

## SPREADSHEET

As you might expect, the Smart spreadsheet looks very similar to the word processor. In its default format the main worksheet displays seven columns and 18 rows of cells. Each cell can contain up to 15 digits or 99 characters. Formulae entered in the cells can be up to 1,000 characters long.

The program can accommodate 9,999 rows and 999 columns using a technique known as sparse matrix storage. Basically, this means that the worksheet only stores those cells which contain data, and ignores the rest. Although this might seem to be an obvious approach, not many programs pay much attention to compression techniques in these memory-rich times.

Like the word-processing program, the

spreadsheet uses virtual-memory addressing to store data on the current worksheet which is too big to fit in main memory. This technique also allows up to 32 worksheets to be current at any time. Formulae, text and figures can be entered on the command line as usual, with cells identified by row and column number.

Two kinds of formula entry, absolute and relative, are permitted. Absolute entry means that the formula refers to the actual cells it uses. With relative entry the computer calculates the cell address relative to the cell where the formula is being entered. For example, if a formula is being entered at cell r6c8, using absolute addressing, writing r5c7 will refer to cell r5c7 itself. With relative addressing it will be taken to mean the cell one up and one to the left. At first sight this seems like hair splitting; its usefulness lies in the fact that you can copy the formula elsewhere in the worksheet and use it there.

The Smart spreadsheet can also perform a number of functions more suited to the scientist or mathematician than the accountant. Matrices can be multiplied and rotated about pivot points. The program can also perform regressions and transpositions. As an added bonus, the spreadsheet can also display results in exponential notation, and although the program defaults to a maximum to two decimal places you can reset it to allow for up to nine places.

# Can integrated software be





The spreadsheet is fast and easy to use, even for a beginner. The use of the confidence levels is especially useful with this module as it allows novices to do simple manipulations without being confronted with the complicated mathematical functions.

A graphics program is provided in conjunction with the spreadsheet, and it is here that you begin to appreciate the real value of an integrated package. Data can be easily transferred from the worksheet and displayed in one of six different formats, including bar, histogram, pie and layer graphs. Once a graph has been created you can title and annotate it.

Within the Graphics command, graphs are defined by marking a block on the spreadsheet. You can then select which of the digrams is required, along with any titles or legends needed. Once the graph is defined you are given a fleeting glance of the diagram before it disappears from the screen. For a more leisurely look you have to use the View command.

A graph can be displayed on the screen either instantly, faded in or opened via a curtain. These fancy effects come into their own when you string a number of such diagrams together, using the Slideshow option.

The database-manager module of the Smart suite can support up to 255 fields per record. Special features of the program

include the ability to perform field calculations and create relational files. You can also create your own customised input screens, and there is a drawing facility to create boxes and lines to make the display more attractive.

Data ranges can be set to trap incorrect entries, and files can be protected by a

**THE SMART SYSTEM**

**PC VERDICT**

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

A well-designed suite of programs suitable for users at all levels.

password system. Further protection can be implemented by defining the data-entry status, which supports Must Enter and read-only fields.

Smart Database has been designed to make file creation as uncomplicated as possible, all the necessary features being supported by the on-screen menus. Files can

be created with either fixed or variable lengths. A fixed-length file will store the set number of characters on a disc, whether the space is used or not, so space-conscious users will probably confine themselves to variable-length files.

Once files have been created you can create an index file, which can be arranged either on a query, sort or key-file basis. Key-file indexes are maintained when a data file is updated, but query and sort indexes are not; users have to reorder the index to keep it up to date.

The Smart Data Manager has features which create relational files. For example, new files can be created from the records contained in two others. You can choose the basis on which records will be selected for the new files, using Boolean logical criteria. Thus the file can consist of all records within the parent files, records common to the two parent files, or the contents of one file which are not common to both parents. The relational file facilities can also work at the field level. Data can be taken from one field and inserted in another file, or can be added or subtracted from existing data within a field.

The primary purpose of integrated software is to enable different applications to share data. In the Smart suite the Send command is used to transfer data applications. It can be accessed from any of

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# as powerful as stand-alones?

It depends.

To fit a powerful word processor, a top-class spreadsheet and a massive database onto one floppy is asking an awful lot.

But we'd be the last to deny that integration makes a lot of sense.

So we're delighted to see Innovative Software's fresh approach, which solves the dilemma rather neatly.

It's called the Smart system.

Each of the three standalone Smart modules is as powerful in its own right as any of the market leaders.

The difference? They work together as seamlessly as any conventional integrated package.

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## The Smart System



The database module handles calculations and relational files.

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the applications at any time, although the options and the complexity of the command varies according to the type of data generated within an application.

When the Send command has been selected, the program displays a menu of applications which the data can be sent to. The program then asks you in what format you would like the document sent. Formats available include Text for transmitting the data as an ASCII file, graphics, or a document. Finally, the software asks whether you wish to enter a project file before executing the command.

### PROJECT PROCESSING

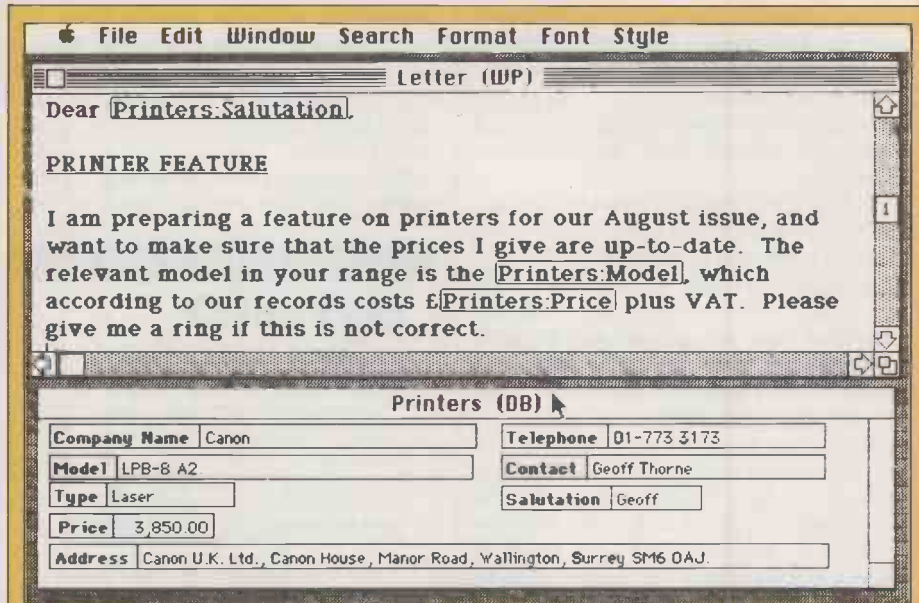
The wide range of options within the Smart system means that a long string of commands is sometimes required. The system incorporates a facility called project processing, which allows frequently used command sequences to be strung together. Executing a project process runs the commands automatically, together with any options required.

To construct a project you run the Remember command, select the Start option and assign a name to the project. You then go through the series of commands that you wish to incorporate in the project. The computer remembers the sequence of key presses, which you terminate with the Finish option.

In addition to the standard application commands you can also use a number of programming commands to produce more sophisticated projects. Among the commands supported within the Smart programming language are procedures, jumps and an If-Elseif-Else conditional branching structure. A project can be made to pause to allow input from the keyboard. The language allows you to build your own menus which can then be incorporated within the project.

### CONCLUSIONS

- The Smart suite is an excellent example of modular software. The modules can be bought and used separately but they integrate well.
- The individual applications all compare well with the best in their field.
- The concept of confidence levels is used to make the package simple for the beginner while providing plenty of power for more experienced users.



You can use the Works database with the word processor for mail merging.

**Ian Stobie** investigates why Microsoft is bringing out a five-function all-in-one package for the Macintosh, when do-it-yourself integration is so easy on this machine.

# MAC WORKS

**M**icrosoft Works is going on sale this summer at a price of around £295. It is a new all-in-one package for the Macintosh which integrates together five of the most common business tasks: word processing, database, spreadsheet, business graphics and communications.

But why bring out an integrated package for the Macintosh at all? Do-it-yourself integration has always been relatively easy on this machine, and Apple's recent introduction of the Switcher operating-system extension makes the process even simpler. Indeed, Microsoft itself is bundling Switcher with its power spreadsheet Excel, to encourage users to integrate it with other applications.

The thinking behind Microsoft's apparently contradictory strategy is that Mac users fall into two distinct camps. On the one hand there are the so-called power users who spend a lot of time using a particular package, thereby getting to know both it and the Macintosh inside out. Power users want high-performance software with lots of features, but they are often quite specialised in their interests. They are quite happy to use a utility like Switcher to link different packages together if the need arises.

The second group want simplicity above all else. They are the newcomers to computing, or people who only do particular tasks on an irregular basis. They

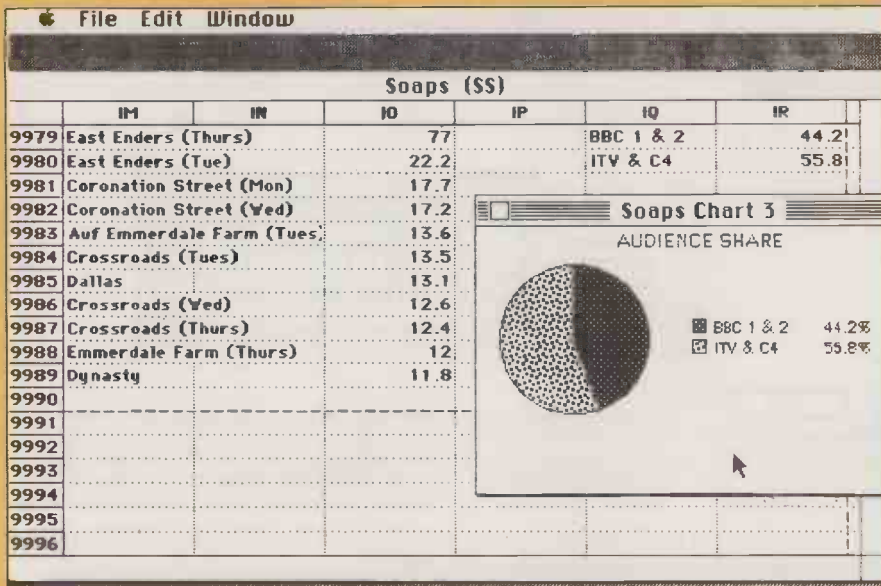
either have very little knowledge of the system, or use it so infrequently that they forget how its finer features work.

Microsoft Works is aimed at the second group of users. It does not aim to cover a tightly defined task in depth; instead it handles a broad range of tasks simply. Microsoft hopes that it will also appeal to power users for tasks outside their main area of interest. The power spreadsheet user, for instance, may turn to Works for the odd bit of word processing or an occasional foray into Telecom Gold.

Works fits on a single disc. The program itself occupies about 290K on the disc, with another 63K of help information contained in a separate file. We were looking at a beta-test version, so these dimensions may change in the final release. Works is considerably smaller than Jazz, its nearest rival, which lacks on-line help altogether. Along with Works you will get a manual and a training disc, but neither were ready in time for us to review.

Microsoft has not yet decided whether to try and squeeze Works on to the 128K Mac. This is technically feasible but will incur performance penalties, and we suspect that the declining number of non-upgraded Macs makes it unlikely to be a worthwhile exercise.

Running our copy of Works on a 512K Mac left us with 285K of free space before opening any documents. This is enough



The Works spreadsheet allows large models and has built-in graphics.

room to run Works together with another small application using Switcher; on a 1Mbyte Mac you have easily enough room to run it with Excel.

The cheap and simple Works approach requires that all documents you are actually working on are held in memory. The disadvantage is that you can easily run out of space, but it also means Works is very quick. Providing the documents are not too big you can have up to 10 of them open at a time. In practice we did not find space a problem, although some users might. You can switch instantly between the documents you have in memory, and with a few restrictions you can copy data between documents of all the different Works types.

Works documents come in four types: word processing, database, spreadsheet and comms. Graphics are handled within the spreadsheet. The opening screen shows icons for each type, and you click on the appropriate icon and the New button to create a new document.

## WORKS AND WP

Since Apple has stopped bundling Macwrite with the Macintosh many new Mac users may want to know how Works compares with it simply as a word processor. Works word processing is superficially similar to Macwrite, but you soon start noticing differences.

Macwrite limits document width to 6.5in., for instance, which is what you display on the Mac's screen. Works is much better for producing wide documents, as it allows you to scroll sideways across a notional piece of paper up to 22in. wide. You can print wide documents sideways on an Imagewriter printer.

Most formatting commands operate at the paragraph level in Works. Tab stops, margins, line spacing, centring and justification are attributes of the paragraph. This takes some getting used to if you are already a long-standing Macwrite user, but it is an

equally valid approach. You can copy paragraph formats from one paragraph to another, or to selected paragraphs in the document, so global formatting changes are easy enough.

Works does not provide the powerful format control of a true power WP package like Microsoft Word, where one change to a format definition produces a change at every place within the document where that definition is used. Neither does it have a built-in spelling checker, thesaurus, outliner or indexer. Works is not trying to be a full-feature word processor.

But it handles the Mac's multiple founts just as well as Macwrite, displaying them in accurate proportional spacing in sizes up to 24 point on the screen. It even goes one better with a built-in drawing facility. You are confined to drawing lines, circles and boxes, but it does mean that you can enhance a piece of text without having to buy Macpaint or Macdraw.

Works is capable of reading and writing documents in Macwrite format. We pulled in existing Macwrite documents up to 30K long, and had several open at a time before running out of memory. The attributes of the text are preserved: tab stops, founts and fount sizes all come across as originally set up in Macwrite. We only noticed changes in the line spacing, which is easily reset.

We were also able to pull in Macpaint images via the Mac's clipboard and scrapbook, and using a public-domain desk accessory called Art Thief. Once you have got a Paint image into a WP document Works is more flexible than Macwrite in what it lets you do with it. You can move it anywhere you like with the hand pointer, change its size and put text on either side of it.

You have the same flexibility over position and size when incorporating graphs created in the Works spreadsheet. To move data from one Works document to another is simple. You just open both documents,

select what you want to move with the mouse, choose Copy from the pull-down menu, select the destination in the other window, again with the mouse, and choose Paste. In this way we were able to move a variety of material into WP documents, including data and graphs from the spreadsheet, and database information and text captured by the Works comms module.

From our brief acquaintance with Works it appears at least as good for word processing as Macwrite, and you benefit from the integration with other Works tasks. This advantage over Macwrite shows up most significantly when using the Works word processor in conjunction with the integrated database for mail merging.

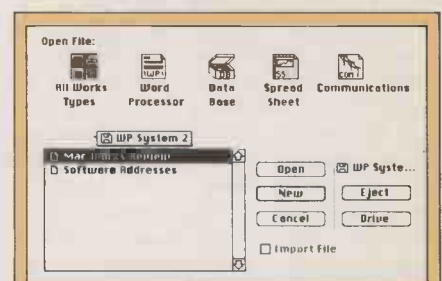
## LIKE MICROSOFT FILE

Works' database is like a cut-down version of Microsoft File. It allows you two views into your data: a Form View that shows a single record at a time, and a List View which looks like a spreadsheet where each row shows a record and each column a field. The Form View is excellent for typing in new data, while the List View is better for making sense of the data that is already there.

Works gives you a free hand over record layout, subject to a limit of about 60 fields per record. You design your own layouts on-screen using the Form View. You can place the fields where you like, moving them round and adjusting their length with a hand pointer. You can keep data in a range of numeric, date and time formats as well as straight text. Works also supports computed fields, so you can set things up so that when you type in a quantity and price, for example, the total is automatically filled in for you.

You can make adjustments to the record

(continued on next page)



## SPECIFICATION

**Description:** all-in-one integrated package aimed at occasional and first-time users; comprises word processing, database, spreadsheet with graphics, and comms

**Hardware required:** 512K Macintosh and 1Mbyte Mac Plus

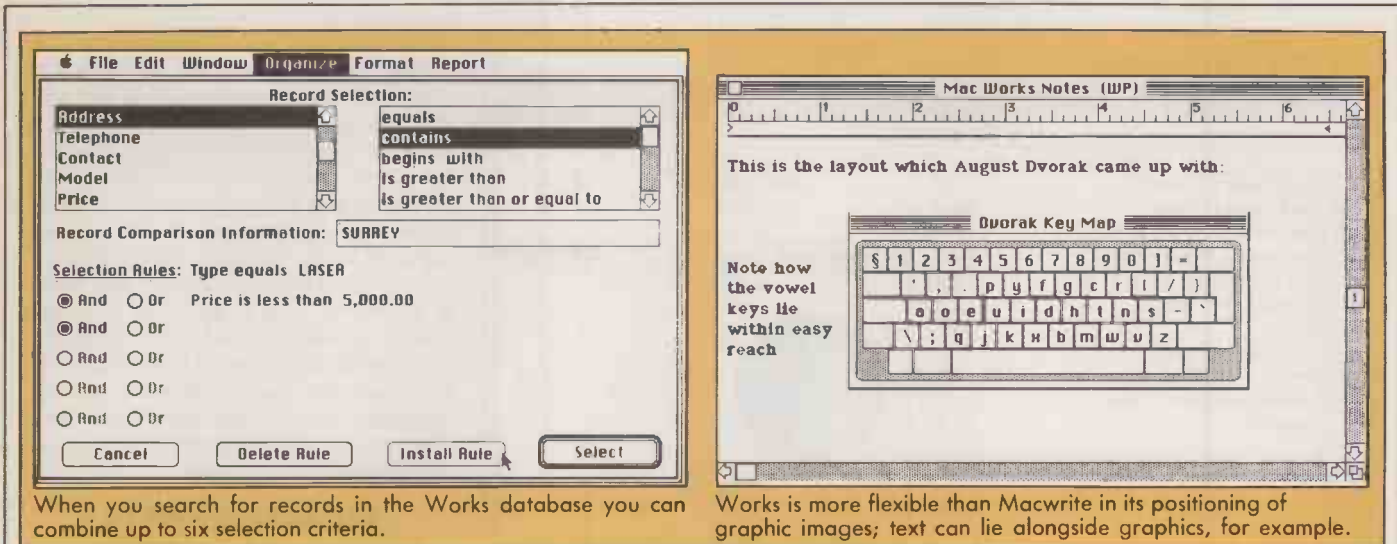
**Publisher:** Microsoft, Excel House, 49 De Montfort Road, Reading, Berkshire RG1 8LP. Telephone: (0734) 500741

**U.K. supplier:** Softsel, Softsel House, Syon Gate Way, Great West Road, Brentford, Middlesex TW8 9DD.

Telephone: 01-568 8866

**Price:** probably £295

**Available:** early summer



When you search for records in the Works database you can combine up to six selection criteria.

Works is more flexible than Macwrite in its positioning of graphic images; text can lie alongside graphics, for example.

at any time, even if you have data loaded up. Appropriate warnings are given when you add or delete a field.

We found Works provided an excellent, simple database, though it does impose some restrictions. You cannot hold pictures in the database — something you can do in Microsoft File or Filevision, for example. And as with Works generally, you can only work on data held in RAM, so there is a limit to the number of records you can deal with.

The database works well in conjunction with the Works word processor for jobs like sending out personalised letters or statements. While in your WP document you select Prepare to Merge from a pull-down menu. A window appears showing the fields of the database currently open, and you just click on the one you want. Inside your WP document a little box appears at the current cursor position, containing the database and field name for reference.

You can repeat this process as many times as you like throughout your document, using the fields in any order and as many times as you like. We even used fields from more than one database. When you are ready to print you select Print Merge from the File menu, and Works prints your document as many times as there are records in the database, filling in the appropriate fields with data from each record taken in sequence. You can also merge selectively, depending on values contained in the database. You can specify up to six criteria, using terms like greater than and less than, and enter comparison data.

## IMPORTS DATA

The Works database is capable of using data originated outside the package. We imported data directly into it from Excel, and also found we could get data in without problems from Macwrite, provided it was set up with Tabs separating each field and Returns at the end of each intended record.

The Works spreadsheet is broadly similar to Multiplan with the addition of simple graphics. The theoretical maximum spreadsheet size is 9,999 rows by 255 columns. The way Works holds spreadsheet data is optimised to economise on space rather than

yield the maximum calculating speed, so it is not as fast as Excel or later versions of Multiplan.

That said, Works provides a powerful spreadsheet in calculating terms, with over 50 built-in functions. It has one or two unusual but useful features like a Find Cell command, which lets you enter a value or text string and returns the position where it is to be found.

The limitations of the Works spreadsheet come when you attempt advanced spreadsheet tasks like goal seeking or consolidating data taken from several worksheets. It has no macro language, which limits your ability to build complicated business models. Compared to other Mac spreadsheets you are limited in what you can do to alter the spreadsheet's appearance in terms of its typography, but if you want to use data in presentations you can transfer a section of a spreadsheet across to a word-processing document and enhance it there.

Works' charting abilities are part of the spreadsheet. You have a choice of a percentage pie chart or four kinds of series chart: line, bar, stack or combination. You tell Works which cells in the spreadsheet the values and titles are to come from. The package then draws the chart in a separate window so that it does not take up space inside the spreadsheet. You can resize this window and place it alongside the relevant part of the spreadsheet, and then watch it redraw as you alter the data contained in the cells.

To draw a pie chart Works expects to find its values arranged in a column, while for a series chart it expects the values to be in a row. This is not as much of a limitation as it seems, as the Paste command has a Transpose option, so you can just move your data to another area of the spreadsheet before displaying it.

A more severe limitation is the small number of chart types. We were not always able to find an appropriate way of displaying particular sets of data. If you want to get heavily into charting you will need to move your data to a more powerful package such as Excel. Works is capable of exporting or importing spreadsheets in Syk or text

format. It does not support .WKS format or DIF.

The comms side of Works provides access to electronic mail or on-line database services via a modem. You can also use it to link to another nearby computer via a direct cable link, though we did not have time to try this out. Works comms are very simple to use as long as you already know comms jargon.

Providing your modem can handle it, Works will cope with speeds from 300 baud to 19,200 baud. It will also support autodial modems. For autodialling you can associate up to eight phone numbers with any group of settings. To initiate the contact you then just click on a Dial button which is displayed on the screen.

We tried Works with Telecom Gold and found it extremely simple. It is obviously well suited for this type of electronic-mail service. Works is not capable of handling viewdata-format data, as used by Prestel and a minority of bulletin boards.

## CONCLUSIONS

- Works succeeds in what it sets out to do: it provides a broad range of functions in sufficient depth to be useful while remaining simple enough to be straightforward to use.

- We were looking at a pre-release beta-test version but found no severe bugs. The fact that we could understand it without a manual, referring only to the on-screen help, is a good recommendation.

- At a likely price of under £300 Works is also quite good value. Apple's recent decision to stop bundling Macwrite and Macpaint should help Microsoft to sell Works.

- The best parts of Works are the word processor and the database, which work very well together. The spreadsheet is powerful enough for most users but the charting is rudimentary by the standards of heavyweight number-crunching packages. The Comms are fine for electronic mail and text-only database and bulletin-board services, but do not handle Prestel.

- Works shows the strength of the all-in-one concept for software at the lower-powered end of the market. The various parts of Works integrate together well, and we found it easy to get data to and from Works from a fair number of other packages.

Although it may do everything, an integrated package may not do everything well. **Mike Lewis** describes some equally effective alternatives.

# ALTERNATIVES TO INTEGRATION

**H**aving your word processing, database, spreadsheet and graphics all in one big bundle might at first sound like an attractive proposition. After all, why mess around with lots of little programs when a single integrated package can do everything for you? That way, there is only one set of controls to learn and the various functions are more likely to work in harmony with each other.

The trouble is that the typical integrated package is a cumbersome beast. Its sheer size makes it difficult to learn, and while it might meet all your needs in one department, it is unlikely to do so in all of them.

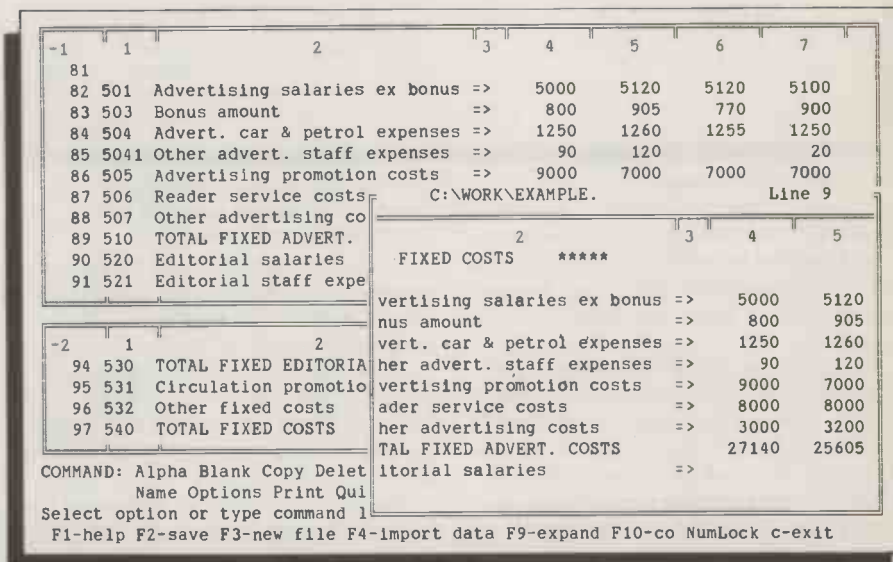
Happily, there are alternatives. If your aim is to be able to switch quickly and easily between applications, it might be worth considering a multi-tasking system. Put simply, this is a program which allows your computer to do more than one thing at a time. The main purpose of multi-tasking is to increase the system's productivity, but in practice most people use it as a way of holding a number of programs in memory together, flicking between them at the touch of a function key.

For example, suppose you are working on a cash-flow forecast and decide that you want to write a memo explaining the assumptions you are using. With multi-tasking you would have two segments of memory in use: one for the spreadsheet, the other for the word processor. Pressing the appropriate key would move you rapidly between the two, bringing up each program at the exact point at which you left it.

Furthermore, the various segments do not have to hold different programs. Using multi-tasking you could invoke the same spreadsheet software twice, each in its own partition, thus allowing you to work on dif-



Microsoft Windows allows several tasks to be run simultaneously.



Using the Sidekick notepad to cut a block from a multiple spreadsheet.

ferent models at the same time. Another option is to use one of the partitions for the operating system's command line. This would enable you to make backups, delete files and so on without having to leave your main application.

One of the first systems to offer this ease of switching — and in many ways the easiest to understand — was Digital Research's Concurrent CP/M. Using it is rather like watching an ordinary television with four channels: programs run on all channels simultaneously, but only one is visible at a time. You can switch from one to another just by pressing a key.

When Concurrent CP/M first appeared in 1983 it could not run programs written for MS-DOS, but Digital Research has enhanced the system by adding MS-DOS compatibility. Now renamed Concurrent DOS, it also supports windows. This means that you can view at least part of the four programs at the same time. However, it does not work with such DOS goodies as sub-directories, batch files, piping and secondary command processors.

Anyone who is used to the traditional A > prompt will find Concurrent DOS very easy to operate. Each window is, in effect, an ordinary text screen on which you simply type commands in the usual way. Only a few control keys are used to manipulate the windows. There are no icons or pull-down

menus and you do not need a mouse or a bit-mapped graphics display.

By contrast, Microsoft's multi-tasking system, Windows, is a fully-fledged windows-icon-mouse environment. It allows any number of tasks to run at a time, either visibly in a window or in background mode. In the latter case the program is represented by an icon on a grey bar at the foot of the screen.

To make a background program visible you use the mouse to drag the icon to the centre of the display, thus opening a window for it. It is possible to split the screen by moving one icon to the border of another window's area. There are also ways of re-arranging and resizing the windows. If the screen gets too cluttered you drag the window back to the grey bar, where it once again takes the form of an icon.

## TOPVIEW

IBM's Topview is another multi-tasking system which, like Windows, can handle a theoretically unlimited number of tasks. In practice, a limit will be imposed by the amount of RAM installed. Unlike the Microsoft product, it does not support extended memory boards, neither does it employ disc-swapping to overcome shortages of memory.

There are several other multi-tasking products to choose from, including Multilink Advanced, Softlogic's Doubledos and E-Z-Dos-It from Hammer Systems. All of them

(continued on next page)

# Integrated SOFTWARE

<> Software Carousel <>

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SoftLogic Solutions, Inc.  
Manchester, NH

O P T I O N S

E Exit from this menu  
C Change Memory Information  
R Rename a Memory Partition  
K Kill a Program  
H Help Display On & Off  
Fx F1 - F10 Switches to the  
Program as in SETUP Box  
Move the hi-lite. < Selects

H E L P Information

Typing one of the  
function (F) keys takes  
you directly to that  
memory partition.  
You can then use the  
program there.

Your	S E T U P	Now	Total	512K
F1.	Articles			128K
F2.	Pascal programming			128K
F3.	Word counter			48K
F4.	Communications session			96K
F5.	Dos command line			48K
F6.	Memory Partition 6, Un-named			00K
F7.	Memory Partition 7, Un-named			00K
F8.	Memory Partition 8, Un-named			00K
F9.	Memory Partition 9, Un-named			00K

(continued from previous page)

are easier to use than either Topview or Windows since they concentrate on giving you the ability to switch between tasks with the minimum of fuss, rather than bogging you down with fancy icon-based desk-top metaphors.

Of course, no multi-tasking system really runs more than one program at a time. They usually work by activating one task while another is waiting for input or output. Although the total processing time is the same, this technique can improve the overall throughput of the system. But if such an improvement is not an important factor you might prefer a simpler solution such as a memory shifter.

Memory-shifting programs are like multi-tasking systems in that they allow a number of applications to remain in RAM together. However, no attempt is made to execute a program other than the one that the user is concentration on. This often makes it easier to grasp what is going on within the system, while still achieving the aim of quick and easy switching between jobs.

The best-known program in this class is Memory-Shift, from Caxton Software. In theory, it allows up to nine programs to share memory. In practice, you would probably be limited to three or four, even with a full 640K RAM. It is trivially easy to operate: just one key is used to cycle through the partitions, and switching is almost instantaneous. One major snag is that it is copy protected, which is rare for this type of product.

The cut and paste command lets you cut text from the screen and put it into a macro. Here is how it works:

- 1) Activate the cut and paste command.
- 2) Press the key you want to hold the cutting.
- 3) Use the arrow keys to move the cursor to the start of the block of text you want to cut.
- 4) Press B to mark the beginning of the block.
- 5) Use the arrow keys to move the cursor to the end of the block.
- 6) Press → to record the marked block to the macro key.

Press ESCape to exit help

Superkey can be used for integration.

Softlogic's Carousel is a memory shifter which allows you to partition RAM according to your needs.

A criticism often levelled at this sort of program is that it is too easy to forget which jobs are active in which partitions. Sooner or later you will switch off the machine without properly closing all the applications or saving all the files. Memory-Shift tries to help with this by warning you that programs are still running when you press Ctrl-Alt-Del.

Another memory shifter is Carousel from Softlogic. It works in much the same way as the Caxton product but has the advantage of supporting Intel-style expanded memory boards. It allows up to 10 programs to reside in RAM but if memory is short you can tell it to use the hard disc for swapping, though this slows things down quite a lot.

One feature that Carousel lacks is the ability to move information from one application to another. This capability is available to a greater or lesser degree in most of the products mentioned. Since easy data transfer is one of the main reasons for opting for an integrated package it is an important point to consider if you are looking for alternative solutions.

The only way for memory shifters and multi-tasking environments to extract data from a program is to copy it directly from the screen. They invariably employ some form of block marking for this, in which the operator uses the cursor keys or mouse to highlight the area in question. The software then copies the selected material to a buffer or a file.

Similarly, the only way for the system to get the data into the receiving program is to fool it into thinking that it is coming from the keyboard. One implication is that graphics cannot be transferred in this way, although Windows does provide a way of sending graphics to a program that has been specially written to receive it. Under Concurrent DOS programs can communicate directly via a system of queues but they have to be specially written to take advantage of this.


A recurring problem with all the

programs mentioned so far is that they need a lot of memory to work well. If you are short of RAM you could do worse than to consider a far simpler solution: a set of pop-up accessory functions, of which Borland's Sidekick is the most famous example.

It is rare to meet anyone who has tried Sidekick who cannot find an immediate use for it. Its notepad alone makes it virtually indispensable, providing a very usable word processor whenever you want it. If you need to enter text while working with a spreadsheet, database or comms package, this is probably a better option than any integrated package or multi-tasking environment.

Sidekick's notepad also has a superior cut-and-paste feature. As with other products, you can only use it to pick up data from the current screen, but you have the advantage of being able to edit this data between the cutting and pasting stages.

A similar facility is offered by another Borland product called Superkey. Although sold mainly as a keyboard enhancer, this program has several features which can help with integrating otherwise disparate programs. For example, you can use it to display your own help screens across the system, independently of the programs currently running.

Furthermore, using a keyboard enhancer to redefine your keyboard can bring you nearer to another of the claimed benefits of the integrated packages, the common user interface. In fact, Superkey and Sidekick, working together with a carefully chosen set of application programs can provide a much better working system than many of the giant do-it-all products — and at a fraction of the cost in terms of memory, performance and ease of learning. 

## SUPPLIERS

**Carousel** Softlogic Solutions, 530 Chestnut Street, Manchester NH03101, U.S.A. Price: \$49.95.

**Concurrent DOS** Digital Research, Oxford House, Oxford Street, Newbury, Berkshire RG13 1JB. Telephone: (0635) 35304. Price: £245.

**Doubledos** Yorkshire Micros, Standard House, James Street, York YO1 3BU. Telephone: (0904) 642941. Price: £99.

**E-Z-Dos-It** Tashkl Systems, 24 Logan Road, Wembley, Middlesex. Telephone: 01-904 4467. Price: £65.

**Memory-Shift** Caxton Software Ltd, 10 Bedford Street, London WC2. Telephone: 01-379 6502. Price: £125.

**Multilink Advanced** ICCT Ltd, Prince Rupert House, 64 Queen Street, London EC4R 1AD. Telephone: 01-248 8895. Price: £395.

**Sidekick** Altor Ltd, 11a Anderston Centre, Glasgow G2 7PH. Telephone: 041-226 4211. Price: £73.

**Superkey** Altor Ltd. Price: £59.

**Topview** IBM U.K. Ltd, PO Box 32, Alencon Link, Basingstoke, Hampshire RG21 1EJ. Telephone: 01-578 4399.

**Windows** Microsoft Ltd, 49 De Montfort Road, Reading, Berks RG1 8LP. Telephone: (0734) 500741. Price: £95.

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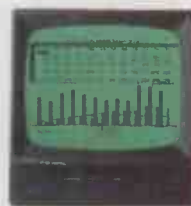
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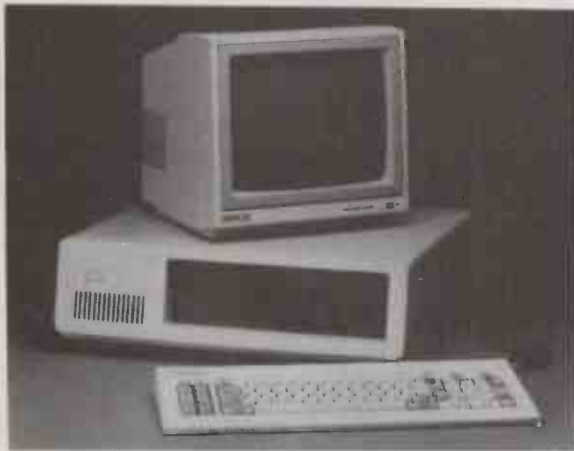
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Submissions should include a brief description which explains what your program does and how it does it. This should be typed with lines double-spaced. The program should be printed with a new ribbon or at double-intensity; the width should be between 75mm. and 90mm., or between 105mm. and 135mm. Also include a disc of your program.

Please send your contributions to

Open File, Practical Computing, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

SPREADSHEETS

# UNITAX

Chris Allen illustrates the principles of good spreadsheet design with a model for calculating your income-tax liability.

JUST AS applications programs can be written in any high-level language, so an application can also be constructed to run on a spreadsheet package. Such an application is called a template. Like an applications program, a template embodies the solution to a general problem. The user then enters the data relating to his or her specific problem, and the spreadsheet processes this data according to the template in order to produce a specific solution.

This article describes a spreadsheet template called Unitax, which is designed to be used for checking your income-tax liability. It was written using Supercalc 1, but should be readily transportable to run on other spreadsheet packages.

Like any other programming exercise, the creation of a spreadsheet template raises issues of design and programming style. The main objectives of an approach to programming may be summarised as follows:

- to design the application in such a way as to identify the steps needed, making a correct solution more likely;
- to produce code which is easily read, so that it is easy to debug and can be understood later, even by another programmer;
- to design code that is as easy to maintain as possible, ensuring that separate steps are carried out in separate blocks;
- to provide the user of the application with as straightforward an environment as possible.

The first three of these objectives are really part of the

philosophy of structured programming, of which much has been written elsewhere. The creation of a satisfactory user environment is not necessarily linked to a structured approach to programming, but with spreadsheet templates the two are inextricably linked.

A spreadsheet is a very special kind of programming environment. When a high-level language is used for programming, the inner workings of the application are completely hidden from the user. It does not matter whether the programmer uses good or bad code since exactly the same results can be produced by both. In the case of a spreadsheet, the screen display seen by the user is a visual representation of the internal layout of the template being used.

All spreadsheets include a number of facilities which are helpful to you if you take a structured approach to program-

ming them. But the programming environment, the user environment and the output facilities are one and the same, and consequently it is all too easy to program a spreadsheet in a non-structured way. For trivial tasks this may not matter a great deal, but as the complexity of your application increases so a structured approach becomes more important.

Most applications consist, in principle, of three basic stages: input, processing and output. The elements making up an application are: variable information entered by the user; standing information; algorithms for validating the information entered; algorithms for processing the information; and routines to output some or all of the results of processing in a form useful to the user.

The processing stage involves the interaction of the variable and standing information with the

algorithms to produce the output data. Typically, much of the input data will form a direct and unchanged part of the output, providing the context within which the calculated parts of the output are to be understood. When you are using a spreadsheet it is tempting to use the input area itself as part of the output, by mixing it with the output area.

Figure 1 shows a trivial spreadsheet constructed without regard to structured programming principles. In this example, the entries at C1 and C2 form part of the output as well as part of the input. Cell C4 is used both for data processing and as part of the output from the template.

Although this mixing of input data, processing and output data is normally of little importance in such a trivial case, there is always the potential for confusion. In this example the word "less" in cell A2 is needed only to provide output in the desired form, but the user has taken it to mean that expenses have to be entered as a negative number. As a result the template reports a profit of £15,000 instead of the correct figure of £5,000.

Where this mixing of the elements occurs, the layout of the whole template is inevitably constricted by the required layout for the output. This has the effect of limiting the number of cells which can be used for processing, and often makes it necessary to use very long and impenetrable formulae. The result is a template which is difficult to debug, and even harder to maintain once the original logic has been forgotten.

For templates of any complexity it is much better to use a separate area for each of the elements. Figure 2 is a reworking of the template in figure 1 which uses this approach and also incorporates some data validation. For such a small computation this approach clearly requires much more spreadsheet space. But for a more complex template the extra space is proportionately much less, and the benefits are considerable.

The template in figure 2 also incorporates some minimal instructions for the user. The best place for instructions is the top-left

Figure 1. Unstructured spreadsheet

	A	B	C		A	B	C
1:Sales			0	1:Sales			10000
2:Less: Expenses			0	2:Less: Expenses			-5000
3:			-----	3:			-----
4:Profit/-loss			C1-C2	4:Profit/-loss			15000
5:			=====	5:			=====

Figure 2. Reworked spreadsheet adopting structured methods.

	A	B	C		A	B	C
1:USER INSTRUCTIONS:				14:-----			
2: Enter data in range A6:C8				15:OUTPUT:			
3: Output range is A16:C20				16:Sales		C7	
4: Error warnings are at A22:C25				17:Less: Expenses		C8	
5:-----				18:		-----	
6:DATA ENTRY:				19:Profit/-loss		C13	
7:Sales			0	20:		=====	
8:Expenses			0	21:-----			
9:-----				22:ERROR WARNINGS: (1=Error, 0= No error)			
10:WORKINGS:				23:Whether error		Error type	
11:Check sales positive IF(C7<0,1,0)				24: C11		Negative sales	
12:Check expenses positive IF(C8<0,1,0)				25: C12		Negative expenses	
13:Compute profit/-loss C7-C8				26:-----			

(continued on next page)

# - O P E N F I L E -

## SPREADSHEETS

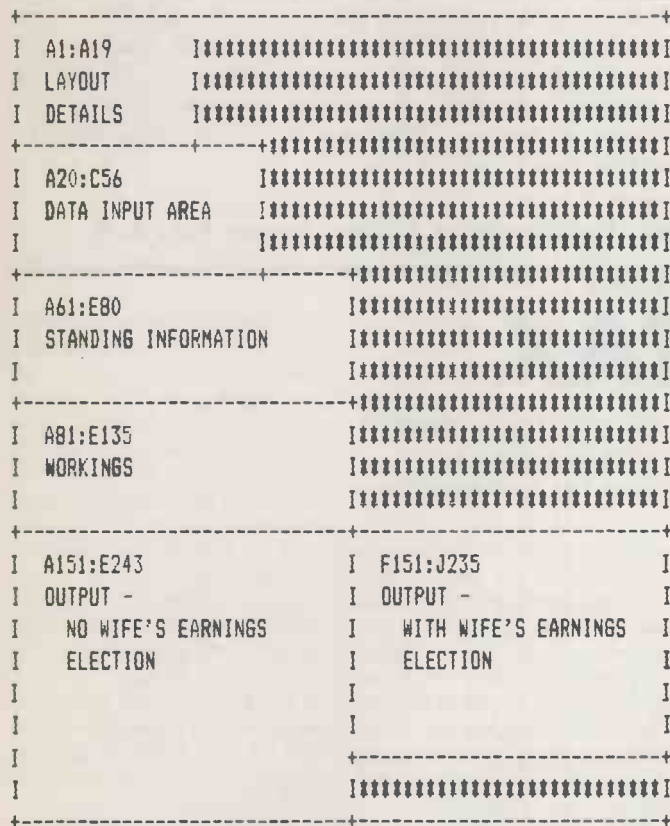


Figure 3. Overall layout of a Unitax spreadsheet.

UNITAX	
SuperCalc ver. 1.12	
UNITAX - Income tax computation spreadsheet	
A1	P= "UNITAX - Income tax computation spreadsheet
A3	P= "Copyright (c) 1986 C.R.ALLEN
A5	P= "-
A6	P= "LAYOUT:
A7	P= " Data input A20:C56
A8	P= " Output - no wife's earnings election:-
A9	P= " Page 1 A151:E210
A10	P= " Page 2 A211:C243
A11	P= " Output - wife's earnings election:-
A12	P= " Page 1 F151:J199
A13	P= " Page 2 F201:J235
A14	P= "-----
A15	P= " Standing information A61:E80
A16	P= " Workings A81:E135
A17	P= "-----
A18	P= "WARNING: This template produces only a tax estimate, and should not be relied upon.
A19	P= " If in doubt, consult a professional accountant.
A20	P= "UNITAX: DATA INPUT AREA: 1985/86 VERSION
A21	P= "1. PERSONAL DETAILS
B21	P= " SELF
C21	P= " WIFE
A22	P= " (a) Whether married (0=No, 1=Yes)
B22	= 0
A23	P= " (b) Extra personal allowances
B23	= 0
C23	= 0
A25	P= "2. EARNED INCOME
A26	P= " (a) Trading profit (less losses b/f)
B26	= 0
C26	= 0
A27	P= " (b) Earnings (including benefits)
B27	= 0
C27	= 0
A28	P= " (c) Pensions, etc.
B28	= 0
C28	= 0

(listing continued on page 110)

(continued from previous page)

corner of the template, since this is the area that is displayed first. The instructions should tell the user the location of the data input and output areas, and where any error messages can be found. The instructions can, of course, be much more comprehensive than this. For example, they might include details of the purpose of the template and any limitations on its use. Detailed lists of keystrokes for various operations might be given or, where appropriate, instructions for using automation facilities, such as SuperCalc .XQT files or Lotus 1-2-3 macros.

Whatever other instructions are given, the inclusion of data output ranges is a must. It is most irritating to be part way through an output command and have to cancel it to check on a range.

There are various possible approaches for the treatment of errors. In the example, calculation proceeds in any case, but the program displays warnings in an area set aside for the purpose. You could also generate error messages in the body of the output area or in the input area next to the offending items. Though the last

strategy appears best, it will only work if automatic recalculation is turned on. Another way to approach the problem would be to convert the offending value to the nearest acceptable value — say, by changing cell C11 to

IF(C7(0,0,C7)

cell C12 to

IF(C8(0,0,C8)

and cell C13 to

C11-C12

A final possibility would be to convert the offending number to the most likely acceptable value — for example, by changing cell C13 to

ABS(C7)-ABS(C8)

One of the most powerful facilities provided by spreadsheets is the capability to insert extra rows and columns into an existing template, while adjusting formulae to compensate for the insertion. Structured spreadsheet programming lets the template designer make the most of this facility; it becomes a hopelessly complex task with an unstructured spreadsheet.

With the input and standing data, calculation, and output sections are separate, new sections can be inserted without altering

	A	B	C
20:	UNITAX: DATA INPUT AREA: 1985/86 VERSION		
21:	1. PERSONAL DETAILS	SELF	WIFE
22:	(a) Whether married (0=No, 1=Yes)	1	
23:	(b) Extra personal allowances	0	0
24:			
25:	2. EARNED INCOME		
26:	(a) Trading profit (less losses b/f)	28500	0
27:	(b) Earnings (including benefits)	0	8750
28:	(c) Pensions, etc.	0	0
29:			
30:	3. INVESTMENT INCOME		
31:	(a) Schedule A (land)	1245	0
32:	(b) Sch. D Case III (untaxed income)	0	0
33:	(c) Dividends (net)	745	350
34:	(d) Building society interest (net)	220	0
35:	(e) Bank interest (net)	0	0
36:	(f) Other income	0	0
37:			
38:	4. DEDUCTIONS		
39:	(a) Mortgage interest paid gross	0	0
40:	(b) Mortgage interest (MIRAS) - gross	2750	0
41:	(c) Retained charges - BR only	300	0
42:	(d) Retained charges - all rates	250	0
43:	(e) Non-retained charges - BR only	0	0
44:	(f) Non-retained charge - all rates	0	0
45:			
46:	5. LOSSES, ETC.		
47:	(a) Trading loss - own income only	0	0
48:	(b) Trading loss - own and spouse's income	3460	0
49:	(c) Discharge capital allowances - total income	0	0
50:	(d) B.E.S. relief	0	0
51:	(e) Allowable pension contributions	1560	0
52:			
53:	6. TAX ALREADY SUFFERED OR PAID		
54:	(a) PAYE [2(b)]	0	1200
55:	(b) Suffered on taxed income [3(f)]	0	0
56:	(c) Other tax paid for this year	0	0

Figure 4. The Unitax input area with sample data.

the essential structure of the template. The new cells are then filled in and patched to the code surrounding them. The most frequent benefit arises when you have to change the processing algorithms without altering the format of the output. The processing area can be allowed to follow its own logic without regard to the shape of the output, and so it is relatively easy to alter. This is especially so where the processing itself has been broken into small chunks in separate cells, instead of vast and complex formulae in a few cells.

The Unitax template is designed to produce an estimate of U.K. income tax liability both for an individual taxpayer and for a married couple. In the case of a married couple, two computations are produced to illustrate the effect of making a wife's earnings election.

I first developed the template four years ago. The present version is a complete rewrite which could itself be amended, if necessary, to add further types of income, deduction and so on without undermining its basic structure. As it stands, Unitax is not intended to cover the whole of income tax, nor can it be guaranteed to produce correct results in the cases which it covers as I have not done the extensive testing that would be needed to reach that level of assurance.

The overall layout of Unitax is shown in figure 3. This demonstrates how the different elements of the application each have their own areas. It would have been neater and more efficient if the output with a wife's earnings election were in the A-E range, below the output without a wife's earnings elections. However, Supercalc 1 allows only 254 rows, so this was not possible.

All cells are protected except for those used for data input. To alter data in any other cell you have to use the Unprotect command. The standing information at A61-E80 consists of personal allowances and tax rates and thresholds for the tax year concerned — in this case, 1985/86. The template can easily be amended to cover a different tax year by substituting the equivalent information for that year.

The workings section, with partial formulae, is shown in figure 5. Comments explain what is going on at each stage. They will not actually mean a lot unless you have some knowledge of tax, but at least they are more informative than the bare formulae.

*The second part of this article will appear next month. Chris Allen is a chartered accountant.*

Figure 5. The workings section of Unitax using the sample data from figure 4.

	A	B	C	D	E
61:STANDING INFORMATION 1985/86					
62:Personal allowance (single/wife's earnings)		2205			
63:Personal allowance (married)		3455			
64:Basic rate of tax (%)		30			
65:Tax on net (basic rate)		B64/(100-B64)			
66:					
67:Tax rates - look-up tables		Threshold	Cua. tax	Threshold	Rate on balance
68:		0	0	B68	30
69:		16200	4860	B69	40
70:		19200	6060	B70	45
71:		24400	8400	B71	50
72:		32300	12350	B72	55
73:		40200	16695	B73	60
74:		Threshold	Threshold		
75:		B68	B68		
76:		B69	B69		
77:		B70	B70		
78:		B71	B71		
79:		B72	B72		
80:		B73	B73		
81:WORKINGS:-		--NO W.E.ELECTION	--WITH W.E. ELECTION		
82:		-SELF-	-WIFE-	-SELF-	-WIFE
83:Total earnings (must be positive)		MAX(SUM(	MAX(SUM(	B83	C83
84:					
85:Tax on dividends		INT(B33*	INT(C33*	B85	C85
86:Tax on building society interest		INT(B34*	INT(C34*	B86	C86
87:Tax on bank interest		INT(B35*	INT(C35*	B87	C87
88:Gross dividends		INT(B33+	INT(C33+	B88	C88
89:Gross BS1		INT(B34+	INT(C34+	B89	C89
90:Gross bank interest		INT(B35+	INT(C35+	B90	C90
91:Total investment income		SUM(B31,	SUM(C31,	B91	C91
92:					
93:Use of own trading losses:					
94: Losses available (check positive)		MAX(B47+	MAX(C47+	B94	C94
95: Use against own earnings		MIN(B83,	MIN(C83,	B95	C95
96: ----Still available		B94-B95	C94-C95	B96	C96
97: Use against own other income		MIN(B91,	MIN(C91,	B97	
98: ----Available against spouse's income		MIN(B48,	MIN(C48,	B98	
99: Spouse's earnings remaining		C83-C95	B83-B95	0	
100: Spouse's investment income remaining		C91-C97	B91-B97	C91	
101: Use against spouse's earnings		MIN(B98,	MIN(C98,	0	
102: ----Losses still unused		B98-B101	C98-C101	D98	
103: Use against spouse's investment income		MIN(B100	MIN(C100	MIN(D100,	D102)
104: ----Trading losses unused		B94-SUM(	C94-SUM(	D94-SUM(	E96
105:Income not covered by losses:					
106: Earnings		B99-B101+C99-C101	D83-D95	E83-E95	
107: Investment income		B100-B103+C100-C1	D91-D97+E91-D103		
108: Total		B106+B107	D106+D10	E106	
109:					
110:Use of discharge capital allowances:					
111: Available		B49+C49	B49	C49	
112: Utilisation		MIN(B108,	B111)	MIN(D108	MIN(E108,
113: Income after capital allowances		B108-B112	D108-D11	E108-E112	
114:					
115:Set off charges allowable at all rates:					
116: Charges available		SUM(B39,	C39,	B40,	C
117: Allowed		MIN(B113,	B116)	MIN(D113	MIN(E113,
118: Income after charges		B113-B117	D113-D11	E113-E117	
119: ----Charges unused (all rates)		B116-B117			
120:					
121:Use personal allowances against income:					
122: Allowances available -					
123: MPA/PA		IF(B22=1,	B63,	B62)	B62
124: WEIA		MIN(B62,	C83)		
125: Total allowances		SUM(B123,	B124,	B23	SUM(D123
126: Use against income		MIN(B118,	B125)	MIN(D118	MIN(E118,
127: Still unused		B125-B126	D125-D12	E125-E126	
128: Use against MIRAS		MIN(B127,	B40+C40)	MIN(D127	MIN(E127,
129: MIRAS still in charge		B40+C40-B128	B40-D128	C40-E128	
130: Income after allowances		B118-B126	D118-D12	E118-E126	
131:					
132:Retained charges (basic rate) subject to recoupment:					
133:		MAX(B41+C41-B130,	MAX(B41-	MAX(C41-E130,	0)
134:Non-retained charges (basic rate) relievable:					
135:		IF(B130>(B41+C41)	IF(D130>	IF(E130>C41,	MIN(C43,

**UNITAX**

(listing continued from page 108)

A30	P= *3. INVESTMENT INCOME	A67	P= *Tax rates - look-up tables
A31	P= " (a) Schedule A (land)	B67	P= *Threshold
B31	= 0	C67	P= *Cum. tax
C31	= 0	D67	P= *Threshold
A32	P= " (b) Sch.D Case 444 (untaxed income)	E67	P= *Rate on balance
B32	= 0	B68	P= 0
C32	= 0	C68	P= 0
A33	P= " (c) Dividends (net)	D68	P= B68
B33	= 0	E68	P= 30
C33	= 0	B69	P= 16200
A34	P= " (d) Building society interest (net)	C69	P= 4860
B34	= 0	D69	P= B69
C34	= 0	E69	P= 40
A35	P= " (e) Bank interest (net)	B70	P= 19200
B35	= 0	C70	P= 6060
C35	= 0	D70	P= B70
A36	P= " (f) Other income	E70	P= 45
B36	= 0	B71	P= 24400
C36	= 0	C71	P= 8400
A38	P= *4. DEDUCTIONS	D71	P= B71
A39	P= " (a) Mortgage interest paid gross	E71	P= 50
B39	= 0	B72	P= 32300
C39	= 0	C72	P= 12350
A40	P= " (b) Mortgage interest (MIRAS) - gross	D72	P= B72
B40	= 0	E72	P= 55
C40	= 0	B73	P= 40200
A41	P= " (c) Retained charges - BR only	C73	P= 16695
B41	= 0	D73	P= B73
C41	= 0	E73	P= 60
A42	P= " (d) Retained charges - all rates	B74	P= *Threshold
B42	= 0	C74	P= *Threshold
C42	= 0	B75	P= B68
A43	P= " (e) Non-retained charges - BR only	C75	P= B68
B43	= 0	B76	P= B69
C43	= 0	C76	P= B69
A44	P= " (f) Non-retained charge - all rates	B77	P= B70
B44	= 0	C77	P= B70
C44	= 0	B78	P= B71
A46	P= *5. LOSSES, ETC.	C78	P= B71
A47	P= " (a) Trading loss - own income only	B79	P= B72
B47	= 0	C79	P= B72
C47	= 0	B80	P= B73
A48	P= " (b) Trading loss - own and spouse's income	C80	P= B73
B48	= 0	A81	P= *WORKINGS:-
C48	= 0	B81	P= *--NO W.E.ELECTION
A49	P= " (c) Discharge capital allowances - total income	D81	P= *--WITH W.E. ELECTION
B49	= 0	B82	P= * -SELF-
C49	= 0	C82	P= * -WIFE-
A50	P= " (d) B.E.S. relief	D82	P= * -SELF-
B50	= 0	E82	P= * -WIFE
C50	= 0	A83	P= *Total earnings (must be positive)
A51	P= " (e) Allowable pension contributions	B83	P= MAX(SUM(B26:B28)-B51,0)
B51	= 0	C83	P= MAX(SUM(C26:C28)-C51,0)
C51	= 0	D83	P= B83
A53	P= *6. TAX ALREADY SUFFERED OR PAID	E83	P= C83
A54	P= " (a) PAYE [2(b)]	A85	P= *Tax on dividends
B54	= 0	B85	P= INT(B33*B65*100)/100
C54	= 0	C85	P= INT(C33*B65*100)/100
A55	P= " (b) Suffered on taxed income [3(f)]	D85	P= B85
B55	= 0	E85	P= C85
C55	= 0	A86	P= *Tax on building society interest
A56	P= " (c) Other tax paid for this year	B86	P= INT(B34*B65*100)/100
B56	= 0	C86	P= INT(C34*B65*100)/100
C56	= 0	D86	P= B86
A61	P= *STANDING INFORMATION 1985/86	E86	P= C86
A62	P= *Personal allowance (single/wife's earnings)	A87	P= *Tax on bank interest
B62	P= 2205	B87	P= INT(B35*B65*100)/100
A63	P= *Personal allowance (married)	C87	P= INT(C35*B65*100)/100
B63	P= 3455	D87	P= B87
A64	P= *Basic rate of tax (%)	E87	P= C87
B64	P= 30	A88	P= *Gross dividends
A65	P= *Tax on net (basic rate)	B88	P= INT(B33+B85)
B65	P= B64/(100-B64)	C88	P= INT(C33+C85)

# • O P E N F I L E •

## SPREADSHEETS

### UNITAX

D88	P= B88	D107	P= D91-D97+E91-D103
E88	P= C88	A108	P= " Total
A89	P= "Gross BSI	B108	P= B106+B107
B89	P= INT(B34+B86)	D108	P= D106+D107
C89	P= INT(C34+C86)	E108	P= E106
D89	P= B89	A110	P= "Use of discharge capital allowances:
E89	P= C89	A111	P= " Available
A90	P= "Gross bank interest	B111	P= B49+C49
B90	P= INT(B35+B87)	D111	P= B49
C90	P= INT(C35+C87)	E111	P= C49
D90	P= B90	A112	P= " Utilisation
E90	P= C90	B112	P= MIN(B108,B111)
A91	P= "Total investment income	D112	P= MIN(D108,D111)
B91	P= SUM(B31,B32,B36,B88:B90)	E112	P= MIN(E108,E111)
C91	P= SUM(C31,C32,C36,C88:C90)	A113	P= " Income after capital allowances
D91	P= B91	B113	P= B108-B112
E91	P= C91	D113	P= D108-D112
A93	P= "Use of own trading losses:	E113	P= E108-E112
A94	P= " Losses available (check positive)	A115	P= "Set off charges allowable at all rates:
B94	P= MAX(B47+B48,0)	A116	P= " Charges available
C94	P= MAX(C47+C48,0)	B116	P= SUM(B39,C39,B40,C40,B42,C42,B44,C44)
D94	P= B94	D116	P= SUM(B39,B40,B42,B44)
E94	P= C94	E116	P= SUM(C39,C40,C42,C44)
A95	P= " Use against own earnings	A117	P= " Allowed
B95	P= MIN(B83,B94)	B117	P= MIN(B113,B116)
C95	P= MIN(C83,C94)	D117	P= MIN(D113,D116)
D95	P= B95	E117	P= MIN(E113,E116)
E95	P= C95	A118	P= " Income after charges
A96	P= " -----Still available	B118	P= B113-B117
B96	P= B94-B95	D118	P= D113-D117
C96	P= C94-C95	E118	P= E113-E117
D96	P= B96	A119	P= " -----Charges unused (all rates)
E96	P= C96	B119	P= B116-B117
A97	P= " Use against own other income	A121	P= "Use personal allowances against income:
B97	P= MIN(B91,B96)	A122	P= " Allowances available -
C97	P= MIN(C91,C96)	A123	P= " MPA/PA
D97	P= B97	B123	P= IF(B22=1,B63,B62)
A98	P= " -----Available against spouse's income	D123	P= B62
B98	P= MIN(B48,B96-B97)	E123	P= B62
C98	P= MIN(C48,C96-C97)	A124	P= " WEIA
D98	P= B98	B124	P= MIN(B62,C83)
A99	P= " Spouse's earnings remaining	A125	P= " Total allowances
B99	P= C83-C95	B125	P= SUM(B123,B124,B23,C23,B50,C50)
C99	P= B83-B95	D125	P= SUM(D123,B23,B50)
D99	P= 0	E125	P= SUM(E123,C23,C50)
A100	P= " Spouse's investment income remaining	A126	P= " Use against income
B100	P= C91-C97	B126	P= MIN(B118,B125)
C100	P= B91-B97	D126	P= MIN(D118,D125)
D100	P= C91	E126	P= MIN(E118,E125)
A101	P= " Use against spouse's earnings	A127	P= " Still unused
B101	P= MIN(B98,B99)	B127	P= B125-B126
C101	P= MIN(C98,C99)	D127	P= D125-D126
D101	P= 0	E127	P= E125-E126
A102	P= " -----Losses still unused	A128	P= " Use against MIRAS
B102	P= B98-B101	B128	P= MIN(B127,B40+C40)
C102	P= C98-C101	D128	P= MIN(D127,B40)
D102	P= D98	E128	P= MIN(E127,C40)
A103	P= " Use against spouse's investment income	A129	P= " MIRAS still in charge
B103	P= MIN(B100,B102)	B129	P= B40+C40-B128
C103	P= MIN(C100,C102)	D129	P= B40-D128
D103	P= MIN(D100,D102)	E129	P= C40-E128
A104	P= " -----Trading losses unused	A130	P= " Income after allowances
B104	P= B94-SUM(B95,B97,B101,B103)	B130	P= B118-B126
C104	P= C94-SUM(C95,C97,C101,C103)	D130	P= D118-D126
D104	P= D94-SUM(D95,D97,D103)	E130	P= E118-E126
E104	P= E96	A132	P= "Retained charges (basic rate) subject to recoupment:
A105	P= "Income not covered by losses:	B133	P= MAX(B41+C41-B130,0)
A106	P= " Earnings	D133	P= MAX(B41-D130,0)
B106	P= B99-B101+C99-C101	E133	P= MAX(C41-E130,0)
D106	P= D83-D95	A134	P= "Non-retained charges (basic rate) relievable:
E106	P= E83-E95	B135	P= IF(B130>(B41+C41),MIN(B43+C43,B130-(B41+C41)),0)
A107	P= " Investment income	D135	P= IF(D130>B41,MIN(B43,D130-B41),0)
B107	P= B100-B103+C100-C103	E135	P= IF(E130>C41,MIN(C43,E130-C41),0)

# CHI-SQUARE

How do you know when you have guessed right? **Owen Bishop** and **Daniel Bishop** present a program which compares the expected number of items in a category with the number actually there.

IN PREVIOUS months we have looked at programs which deal with data taken from measurements. Examples have included measurements of production in units manufactured per shift, measurements of temperature in degrees Celsius, and measurements of weight in grams. This month's article describes a test for data of a different kind, called enumeration data, derived by simply counting the number of objects in two or more categories.

For example, a traffic census can generate enumeration data where the categories are private cars, light lorries, heavy goods vehicles, motor cycles and bicycles. You would enumerate how many of each category pass a census point in a given period of time. Or you might be interested in the composition of a workforce, where the categories are trainees, office staff, sales, machinists, drivers, security staff. You would then enumerate how many employees there are in each category.

## LEAST POPULAR

The results of another possible study are shown in the table below. On the basis of past experience the manager of a superstore considers that for every case of the least popular blends, Gunpowder and Lapsang Souchong, the store sells two cases of Earl Grey or English Breakfast and three cases of the most popular teas, Assam and Darjeeling. These proportions of sales are shown in the second column of the table.

In the week concerned, total sales of all blends were 165 cases. If sales were strictly in accordance with the manager's expectations the number of cases sold would have been as shown in the third

column, expected sales. The actual sales are shown in the fourth column.

It seems that the manager's experience is quite a good basis for deciding stock levels. For all blends except Lapsang Souchong, actual sales are within 1.5 cases of expected sales. However, sales of Lapsang Souchong exceed expectation by over four cases, which is 30 percent higher than forecast. Is Lapsang Souchong more popular than the manager believes? Should stocks of this blend be increased? It would be unusual if sales in any given week were to be exactly as predicted, so it is no surprise that the sales of each blend differ from expectation by one or two cases. But what size of difference should lead the manager to question the original assumptions about popularity?

The chi-square test is based on a statistic which is a measure of the amount by which an actual enumerated value differs from the expected value. If the number expected in a given category is E and the number actually occurring in that category is A, the value of chi-square is

$$(E-A)^2/E$$

The bigger the difference, the bigger the value of chi-square.

The Chi-Square program calculates chi-square for each category and finds their total. With the values in the table chi-square is 1.485. You then use the known properties of chi-square to discover if the total chi-square indicates that there is an unreasonably large discrepancy between the values observed and the expected values.

Books of statistical tables nearly always include a table showing the probability of obtaining any given

## CHI-SQUARE

```

10 REM- CHI-SQUARED (1xN)
20 REM- A Statistical Utility Program
30 REM- -----
40 REM- by Owen and Daniel Bishop
50 REM- -----
60 REM- Version 1.0 - 16/12/85
70 REM- For the BBC Micro Model B
80 REM- -----
90 *FX4,1
100 *TV 255,1
110 MODE7:PROCcol:PRINT"CHI-SQ. (1xN)"
120 DIM SC(3,15),CL$(1),RL$(15),DF(1),
U(123,4),X(4):FIOFF=0
130VDU31,0,2:PROCcl1:PROCbtm:PROCcol:F
ROCnum("How many categories? (2-15)",1,2
,1,15):NR=QN
140T=0:VDU31,0,2:FORJ=1 TO NR:PROCnum
(" ",1,0,0,0):SC(1,J)=QN:VDU 30,31,0,J+1:
PROCcl1:PRINTSTR$(J),SC(1,J):T=T+SC(1,J)
:NEXT
150 VDU31,0,2:PROCcl1:PROCbtm:PROCcol:
PRINT"Enter expected results"
160FIOFF=1:ET=0:VDU31,0,2:FORJ=1 TO N
R:PROCnum(" ",1,0,0,0):SC(2,J)=QN:VDU 30,
31,0,J+1:PROCcl1:PRINTSTR$(J),SC(1,J),SC
(2,J):ET=ET+SC(2,J):NEXT:FIOFF=0
170XP=0:FOR J=1 TO NR:SC(2,J)=SC(2,J)
*T/ET:XP=XP+(SC(1,J)-SC(2,J))^2/SC(2,J):
NEXT
180PRINT"CHI-SQUARE = ";INT((XP+.0005
)*1000)/1000
190IF XP>10 OR NR<3 THEN GOTO 560
200PROCbtm:PROCcol:PRINT"Calculating p
robability"
210 ON ERROR GOTO 550
220 D=20:DX=.1:F2=1
230 FOR J=0 TO 4:X(J)=0:NEXT
240 V=NR-1:VX=V/2-1:XQ=INT((XP+.05)*10
)*2:IF XP>60 THEN XP=60
250 IF XP>10 THEN XQ=INT(XP+.5)*2:D=2:
DX=1
260 IF V/2=INT(V/2) THEN 320
270 V2=V/2
280FORJ=1 TO V2-.5
290F2=F2*(V2-J)
300NEXT
310F2=F2*1.77245:GOTO 360
320V2=V/2-1
330FORJ=1 TOV2

```

value of chi-square for a given number of categories. The program goes one stage further by calculating the probability directly. In this example the program gives the probability as 0.918. This means that there is a probability of 91.8 percent, or just over nine out of 10, of obtaining by chance a set of figures in which the actual sales differ from the expected sales by as much or more than the figures of the table. Chance variations could be brought about by such random events as regular customers being away on holiday, or others deciding to stock up with an extra packet because the one at home is

nearly finished. These are the random variations in customer behaviour which tend to cancel each other out in due course.

With a probability as high as 0.918 you can be over 90 percent certain that any discrepancies between expected and actual sales are purely random ones of the kind just described. Perhaps it just happened that a larger than usual number of customers ran out of Lapsang Souchong that week. The next week, sales of Lapsang Souchong will probably be down again. Whatever the reason, there is no need for the buying policy to be revised.

Of course, there still remains the

	Expected sales (proportion)	Expected sales	Actual sales
Assam	3	41.25	41
Darjeeling	3	41.25	40
Earl Grey	2	27.50	27
Eng. Breakfast	2	27.50	26
Green Gunpowder	1	13.75	13
Lapsang Souchong	1	13.75	20
Totals	12	165	165

Number of cases of each blend sold.



```

340F2=F2*J
350NEXT
360FORJ=3TOXQ+3
370JX=(J/D-DX)/2:U(J,0)=JX^VX/EXP(JX)/
2/F2
380NEXT
390FORK=1 TO 4
400XU=3-K
410FORJ=1 TO XQ+XU:U(J,K)=U(J+1,K-1)-U
(J,K-1):NEXT
420NEXTK
430FORK=0 TO 4 STEP 2
440FOR J=3-K/2 TO XQ+1-K/2 STEP2:X(K)=
X(K)+U(J,K):NEXT
450NEXT
460A=DX*(X(0)+X(2)/6+X(4)/180)
470VDU31,0,19:PRINT"Probability = ";IN
T((1.005-A)*1000)/1000
480 PROCbtm
490*FX21,0
500VDU31,39,22
510 K#=GET#
520 IF K#="E" THEN 150
530 IF K#="R" THEN RUN
540 VDU7:GOTO 510
550 ON ERROR OFF
560 VDU31,0,19:PRINT"Probability not a
vailable"
570 GOTO 480
580 DEF PROCnum(Q#,Q1,Q2,Q3,Q4)
590 *FX21,0
600 PROCcol:PRINT Q#;:INPUT""QN#
610 QN=VAL(QN#)
620 IF QN=0 AND QN#<>"0" THEN 650
630 IF FIOFF=0 AND QN#<>INT(QN) THEN 65
0
640 IF (Q3=0 OR QN<=Q4) AND (Q1=0 OR Q
N>=Q2) THEN ENDPROC
650 PROCline
660 GOTO 590
670 ENDPROC
680 DEF PROCalpha(Q#,Q1)
690 *FX21,0
700 PROCcol:PRINT Q#;:INPUT""QR#
710 IF LEN(QR#)<=Q1 OR Q1=0 THEN ENDFR
OC
720 PROCline:GOTO 690
730 DEF PROCline:VDU11:PROCc11:VDU7:EN
DPROC
740 DEF PROCbtm:VDU31,0,20:PROCc1s:VDU
31,0,20:ENDPROC
750 DEF PROCcol
760 PRINT CHR#130;
770 ENDPROC
780 DEF PROCc1s
790 LOCAL CRS%,V,H
800 V=VPOS:H=POS
810 CRS%=999-H-(40*V)
820 VDU23,1,0;0;0;0;
830 REPEAT:IF CRS%<255 THEN 850
840 CRS%=CRS%-255:PRINTSTRING$(255,CHR
#32);
850 UNTIL CRS%<255
860 PRINTSTRING$(CRS%,CHR#32);
870 VDU31,H,V
880 VDU23,1,1;0;0;0;
890 ENDPROC
900 DEF PROCc11
910 LOCAL V,H
920 V=VPOS:H=POS
930 PRINT STRING$(40-H,CHR#32);
940 VDU31,H,V
950 ENDPROC

```

possibility that Lapsang Souchong really is more popular than the manager believes. It might be worth collecting sales data for a few more weeks to see if there is a permanent effect. But in general, a probability of 0.9 or over means that the numbers found in each category are in broad agreement with expected numbers. A low probability, say 0.1 or under, indicates that actual numbers differ significantly from what you were expecting.

Data required for the chi-square test consists of numbers of object or individuals in different categories. This test does not use a data file on disc. Before starting the

test, set out a table on paper listing the categories and the number of objects or individuals they actually contain. There can be up to 15 categories, but if there are fewer than eight objects in any category the test is unreliable, and you should either collect more data or amalgamate some of the categories. Next write down the numbers you would have expected to find; these values need not be integers.

Load and run the program, file name CS(1XN), and key in the number of categories. The cursor then goes to the top-left corner of the screen. Key in the numbers actually found in each category;

these values must be integers. The screen then clears and you are asked to key in the expected numbers for each category; these values need not be integers. The table of actual and expected numbers is then displayed, together with the value of chi-square for these results. The program then calculates and displays the probability of obtaining values which differ as much or more from the expected values than those you actually obtained. Occasionally, the program is unable to calculate the probability with sufficient precision. In these instances you should refer to a published table of chi-square.

To repeat the test with the same data but a different set of expected values key E. To rerun the program with new data key R.

*The statistics programs and tests covered in this series include histograms, scattergrams, essential statistics, chi-square test, runs test, variant ratio test, analysis of variants and binomial test. All the programs, along with five others, are available in BBC Basic 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.*

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# CHAIN COMMAND

**A J Metcalfe** presents a routine which emulates the chain function found in CP/M 3.1 for earlier versions of the operating system.

ONE of the many enhancements in CP/M 3.1 is the BDOS call, function 47, which allows one machine-code program to chain another. I have written a short routine to allow the same thing under any CP/M system with a BIOS jump table. It may be used, for example, to display a directory after completion of a program, or to execute an MBasic program with a single command, including loading machine-code sub-routines, setting file and memory parameters, etc.

The subroutine works by intercepting BIOS calls to check console status, read a character and print a character. Before calling the routine a valid command line must be set up at a location referenced by DE, ending with a null, 00. When Init is called it alters the BIOS jumps to point to CStat, Print and Input. The routine then performs a warm boot.

From this point onwards all input requests are handled by Input, which reads characters from the buffer and returns them as typed characters until a null is encountered, when Carriage Return is sent to terminate the request. Throughout this time Console Status requests will return -1, representing Character Waiting. The Print subroutine intercepts characters sent to the screen and returns without printing them. This prevents the command line from appearing on the screen. The Print subroutine performs the additional function of restoring the BIOS jump table upon completion of the input.

The routine must be used with care. For example, if the command line is not terminated with a null the routine will keep reading characters until one is encountered, and any characters encountered meanwhile will be sent to the Console Command Processor (CCP). On termination of an input by a Carriage Return found in memory the CCP will examine it, and if it is not recognised will scan the default drive for a transient matching the command. If it cannot find one it will generate an error message — though the message will not be printed because all console output is being intercepted. The CCP then waits for another input, which will be gibberish supplied by the routine. The result is continual accessing of the disc as

(continued on next page)

## CHAIN COMMAND

```

:TESTCHAIN.ASM program to test CHAIN.LIB library routine
:Prints a message and displays directory of disk

000A =      LF      EQU      0AH
000D =      CR      EQU      0DH
0005 =      BDOS    EQU      0005H

0100                      ORG      0100H
0100 110E01                LXI      D,MESAGE
0103 0E09                  MVI      C,09H
0105 CD0500                CALL     BDOS                      :Print message
0108 112A01                LXI      D,COMAND                  :[DE]=start of command
010B C32E01                JMP      CHAIN                    :Execute chain

010E 0D0A457865MESAGE: DB      CR,LF,'Executing CHAIN routine'.CR,LF,'S'
012A 44495200 COMAND: DB      'DIR',0

:CHAIN.LIB subroutine to allow a user program to
:pass a command line on to CCP following a warm
:boot. To use this routine, call it with DE pointing
:to a valid command line - which must end with a
:null character (00H).

:The routine works by intercepting BIOS calls to
:Const, Conin and Conout as follows:

:(a) Const calls return -1 (character waiting)
:(b) Conin reads characters from the buffer and sends
:    them to the CCP each time an input request is
:    intercepted.
:(c) Conout calls return without printing anything -
:    preventing the command line from appearing on the
:    screen.

0000 :=      BIOS    EQU      0          :Address of BIOS is unknown at
:                                     :Assembly time - hence zero

:                                     Enter here to chain to program

012E EB          CHAIN: XCHG
012F 22B101      SHLD  NXTCHR :Initialize pointer to command
0132 CD3801      CALL  INIT   :Alter BIOS jump table
0135 C30000      JMP    0000H  :Do a warm boot & pass control
:                                     :to CCP

:                                     Alter BIOS jumps for Const, Conin and Conout

0138 3A0200      INIT:  LDA    0002H  :High byte of jump table
0138 325801      STA    B1+2  :Correct references to BIOS
013E 326101      STA    B2+2
0141 326401      STA    B3+2
0144 326D01      STA    B4+2
0147 327001      STA    B5+2
014A 327901      STA    B6+2
014D 32A301      STA    B7+2
0150 32A901      STA    B8+2
0153 32AF01      STA    B9+2

:                                     Patch BIOS jump table

0156 2A0700      B1:   LHLD  BIOS+7
0159 22B601      SHLD  CONST  :Address of Const routine
015C 217B01      LXI   H,CSTAT
015F 220700      B2:   SHLD  BIOS+7  :Call intercepted by CSTAT

0162 2A0A00      B3:   LHLD  BIOS+10
0165 22B801      SHLD  CONIN  :Address of Conin routine
0168 218601      LXI   H,INPUT
016B 220A00      B4:   SHLD  BIOS+10 :Calls intercepted by INPUT

016E 2A0D00      B5:   LHLD  BIOS+13
0171 22BA01      SHLD  CONOUT :Address of Conout routine
0174 217E01      LXI   H,PRINT
0177 220D00      B6:   SHLD  BIOS+13 :Calls intercepted by PRINT

017A C9                      RET

:                                     The following code is executed only through
:                                     intercepted BIOS calls

:                                     Return console character waiting

017B 3EFF      CSTAT: MVI    A,OFFH
017D C9                      RET
    
```

(listing continued on next page)

(continued from previous page)

the CCP searches for non-existent transients, and no screen display.

To help in debugging it is instructive to alter Print to print

```
0185 LHL D CONOUT
      PCHL
```

The location is given for reference; delete the Return in this case.

The subroutine is listed here attached to a test program which prints a message and then displays a directory of the current disc. It should be added to the source listing of the program before assembly. Alternatively, it can remain semi-permanently resident, and one subroutine can then be called by a number of programs.

The same technique can be applied to provide input to any program, including one written in MBasic, in much the same way as Submit and XSub — though there is one exception, as they only work with BDOS function 10. In such cases care is needed since some programs check console status and may, for example, abort a print run if a character is received. MBasic checks for Control-C, which may cause problems since the Inkey statement will not work if CStat does not function. In such cases the routine must be tailored to fit.

### CHAIN COMMAND

(listing continued from previous page)

```

:      :      Return without printing
:      :      Restores BIOS jumps if necessary

017E 3AB301 PRINT: LDA      INCHAR  :Load previous character
0181 B7      ORA      A          :Was it null?
0182 CC9E01 C2      UNINIT  :If so reset BIOS jumps
0185 C9      RET

:      :      Handle input requests

0186 22B401 INPUT: SHLD   OLDHL  :Save CCP's HL
0189 2AB101      LHL D   NXTCHR
018C 7E      MOV    A,M      :Get the next character
018D 32B301 STA    INCHAR  :Save for use by PRINT
0190 23      INX    H
0191 22B101 SHLD   NXTCHR  :Increment buffer pointer
0194 B7      ORA    A          :Test buffer character
0195 C29A01 JNZ    NOTEND  :Jump if not end
0198 3E0D    MVI    A,ODH    :Else return <CR> to CCP
019A 2AB401 NOTEND: LHL D   OLDHL  :Restore CCP's HL
019D C9      RET

:      :      Restore BIOS jumps

019E 2AB601 UNINIT: LHL D   CONST
01A1 220700 B7:    SHLD   BIOS+7  :Restore Const jump

01A4 2AB801      LHL D   CONIN
01A7 220A00 B8:    SHLD   BIOS+10 :Restore Conin jump

01AA 2ABA01      LHL D   CONOUT
01AD 220D00 B9:    SHLD   BIOS+13 :Restore Conout jump

01B0 C9      RET

:      :      Scratch pad area

01B1      NXTCHR: DS      2      :Address of next char of
                                :command (3.1 assumes 80H)
01B3      INCHAR: DS      1      :Last character sent to CCP
01B4      OLDHL:  DS      2      :Space to store CCP's HL
01B6      CONST:  DS      2      :Address of CONST routine
01B8      CONIN:  DS      2      : " " CONIN "
01BA      CONOUT: DS      2      : " " CONOUT "
```

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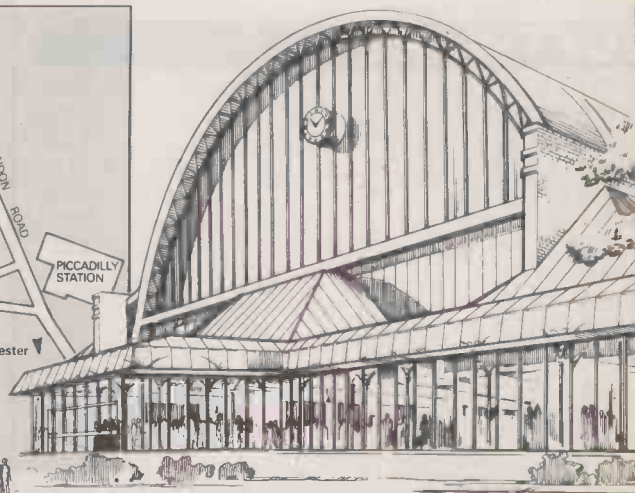
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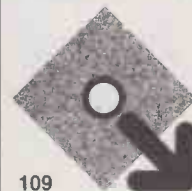
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