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Cover photograph by Ian Dobbie (screen graphics were done on an Apple II with graphics tablet using software by Nigel Cross).

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One of the most innovative business programs on the market. Replaces a manual cash book system, e.g. Simplex or 'All-in-One'. Written by practising Chartered Accountants, this practical program is simple to use and will replace your manual cash and bank records. By giving you access to vital management information as and when you want it, it will enable you to keep more positive financial control of your business.

The software is extremely well and lucidly documented, and Gemini provide a full technical back-up and product update documented, and Gemini provide a full technical back-up and product update.

Available with the following features:- Daily Journal routine for entering transfers between accounts and year end adjustment for debtors, creditors etc. • Trial balance at any time • Interfaces to 'Final Accounts' program to produce balance sheet headings • Option for departmental analysis of sales and purchases • Audit trial printout of all transactions. • Journal routine for entering transfers between accounts and year end adjustment for debtors, creditors etc. • Trial balance at any interval • Interfaces to 'Final Accounts' program to produce balance sheet headings • Option for departmental analysis of sales and purchases • Audit trial printout of all transactions.

FINAL ACCOUNTS PROGRAM FOR BBC 32K, TORCH, SPECTRUM 48K

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Requires Cash Book module. This program will take your cash book data to the logical conclusion of balancing sheets, trading and profit/loss account and notes to the accounts i.e. fixed assets, land and buildings and capital accounts. Final accounts (BBC version) links to 'Beebplot' for graphic data presentation.

Format: Torch disk, BBC disk/cassette, Spectrum cassette.

Special Offer – Cash Book and Final Accounts together – £95

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Compatible with most micros. See table. Ideal for the small business. A complete suite of programs together with generated customer file for producing crisp and efficient business invoices and monthly statements on your line printer. All calculations include VAT automatically, and the program allows your own messages on the form produced. This program gives you superb presentation and saves time on one of the most tedious tasks in the office.

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Compatible with most micros. See table. A gem of a program, all for cassette, with the following features: Daily Journal. Credit Sales. Cash Sales. Credit Purchases. Purchases—other. Sales Ledger. Purchase Ledger. Bank Account. Year to date summary. A fully interactive program suitable for all businesses. Files can be saved and loaded and totals from one file carried forward to another on cassette. Particularly useful from a cash flow point of view, with an immediate accessibility to totals for debtors and creditors. Bank totally supported with entries for cheque numbers, credits and, of course, running balance.

MAILING LIST £19.95

Compatible with most micros. See table. A superb dedicated database to allow for manipulations of names and addresses and other data. Gemini's unique 'searchkey' system gives you a further ten 'user-defined parameters' to make your own selections. Features include the facility to find a name or address when only part of the detail is known, it will print labels in a variety of user specified formats.

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Compatible with most micros. See table. The program that everyone needs, the most valuable and versatile in your collection. Facilities include sort search, list print if required. Can be used in place of any card index application; once purchased you can write your own dedicated database to suit your particular needs with a limitless number of entries on separate cassettes.

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Compatible with most micros. See table. Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account, mortgage, H.P., etc. This program also allows you to plot graphically by Histograms your monthly outgoings.

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"Ideally suited to the way most offices run......”

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BEEBCALC £19.95
DRAGONCALC £19.95

FOR BBC AND DRAGON 32. Spreadsheet processors have proved to be important tools for using micros in business, scientific and domestic financial applications.

**POSITION**

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
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<tr>
<td>1</td>
<td>-J.B. SNOOKER T/A POT-BLACK</td>
<td>2</td>
<td>PROJECTED CASH FLOW</td>
<td>3</td>
<td>YEAR ENDED</td>
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<td>7</td>
<td>INCOME</td>
<td>8</td>
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<td>REVENUE EXPENDITURE</td>
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<td>Purchases</td>
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<td>13</td>
<td>Advertising</td>
<td>14</td>
<td>Director's salary</td>
<td>15</td>
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<td>Insurance</td>
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</tr>
<tr>
<td>19</td>
<td>Repair &amp; renewals</td>
<td>20</td>
<td>Hire of equipment</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Without any programming knowledge at all, you may:-

* Set up a computerised spreadsheet, with chosen row and column names.
* Specify formulae relating any row or column to any other.
* Enter your source data and have the results calculated.
* Save the results on tape (or disk- BBC) for later reloading and manipulation.
* Print the tabulated results in an elegant report format.

Experienced users may access saved files and write their own reporting or graphics presentation programs for the results.

Some typical applications:-

- Small business accounting applications, e.g. profit and loss statements and cashflow projections, break even analysis etc.
- Investment project appraisal- anything from double glazing to oil rigs!
- Comparing rent/lease/buy options.
- Processing the results of scientific experiments or field studies.
- Engineering calculation models.
- In fact anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

**Program Availability Chart:-**

<table>
<thead>
<tr>
<th>Model</th>
<th>Spectrum</th>
<th>GRADY</th>
<th>GRADY</th>
<th>BASIC</th>
<th>BASIC</th>
<th>BASIC</th>
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<th>BASIC</th>
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<td>16k or 48k</td>
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<td>8k or 16k</td>
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<td>24k or 48k</td>
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</table>

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Important new additions to the Gemini family. Present numeric and string data together in easily understood pie chart, histogram or graph format. Beebplot has a built-in interface to Beebcalc, and both Beebplot and Spectrumplot have built in interfaces to the Final Accounts program of Cashbook. The facility for mathematical function plotting is also provided. The BBC version has a high resolution screen dump for the Epson or CP-80 printers, and the Spectrum version dumps to the Sinclair printer via the 'copy' key. A very useful program that will give superb results either from direct input of data from the keyboard or via simple access to other software data files. A must for business and education.

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<table>
<thead>
<tr>
<th>D Connectors</th>
<th>No. of Ways</th>
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<td>Male</td>
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<tr>
<td>Female</td>
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<td>10</td>
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</tr>
<tr>
<td>Rounded</td>
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**JUMPER LEADS**
- 24 Ribbon Cable with Headers £3.40
- Single £1.50 24pin £3.50
- Double £2.50 24pin £4.50
- Ribbon Cable with Sockets £2.20
- Lead £1.50 24pin £2.50
- Female £1.20 24pin £3.20

**APHEONCONNS**

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<tr>
<td>DIN 41613</td>
<td>WIRE 25</td>
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**EDGECONECTORS**

**CABER Connection**

| 24-pin Male U-Connector | £90 |
| 24-pin Male F-Connector | £90 |
| 24-pin Female U-Connector | £90 |
| 24-pin Female F-Connector | £90 |

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<table>
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**COMPONENTS**

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<tr>
<td>285</td>
<td>£80</td>
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</table>

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1 Lochaline Street, London W6 9SJ

Telex 263559 Micro G

□ Please send me information on the ________________

□ Dealer □ End User □ Urgent □ Please phone me

---

**Name**

**Company**

**Address**

---

**Telephone**

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**Software Agents Ltd**

10 Eastfield Parade, Forbes Avenue, Potters Bar, Herts. EN6 5ND

Potters Bar (0707) 59404
For Line Surge Suppression
The SYSTEM SAVER provides essential protection to hardware and data from dangerous power surges and spikes.

By connecting the Apple II power input through the SYSTEM SAVER, power is controlled in two ways: 1) Dangerous voltage spikes are clipped off at a safe 130 Volts RMS/175 Volts dc level. 2) High frequency noise is smoothed out before reaching the Apple II. A PI type filter attenuates common mode noise signals by a minimum of 30 dB from 600 khz to 20 mhz, with a maximum attenuation of 50 dB.

For Cooling
As soon as you add 80 columns or more memory to your Apple II you need SYSTEM SAVER.
Today's advanced peripheral cards generate more heat. In addition, the cards block any natural air flow through the Apple II creating high temperature conditions that substantially reduce the life of the cards and the computer itself.

SYSTEM SAVER provides correct cooling. An efficient, quiet fan draws fresh air across the motherboard, over the power supply and out the side ventilation slots.

For Operating Efficiency
SYSTEM SAVER contains two switched power outlets. As shown in the diagram, the SYSTEM SAVER efficiently organizes your system so that one convenient, front mounted power switch controls SYSTEM SAVER, Apple II, monitor and printer.

The heavy duty switch has a pilot light to alert when system is on. You'll never use the Apple power switch again!

Easy Installation
Just clips on. No mounting or hardware required. Color matched to Apple II.

Compatible with Apple Stand
All these features have made System Saver the top selling Apple II and IIe peripheral in America. Now available at your local dealer. If yours doesn't stock System Saver yet, have him contact our distributor, Softsel Computer Products 01 844-2040.

Kensington Microware Ltd.
919 Third Avenue, New York NY 10022
(212) 486-7707 Telex: 236200 KEN UR

KENSINGTON MICROWARE
SMORGASBOARD

The only board your IBM Personal Computer may ever need.

SMORGASBOARD from Kensington Microware is a multi-function board for your IBM Personal Computer that greatly increases the capabilities of your PC while only using one expansion slot. SMORGASBOARD is completely hardware and software compatible with the PC. SMORGASBOARD combines the following 8 functions to enhance your IBM PC.

256K RAM MEMORY EXPANSION from 64K to 256K bytes in 64K byte increments. Additional memory enhances many software packages, including financial spreadsheets such as 1-2-3, VisiCalc and MultiPlan.

SERIAL PORT connects modems, letter quality printers and other serial devices. The serial port may be configured as COM1 or COM2. IBM PC communications software is fully supported.

PARALLEL PRINTER PORT Centronics compatible parallel printer interface, is identical to IBM's Parallel Printer Adapter and may operate as LPT1, LPT2 or LPT3. This interface is plug compatible with standard printer cable. It can also be configured as a bidirectional SASI interface.

CLOCK/CALENDAR so you no longer have to input the time and date each time you reboot your PC. SMORGASBOARD's chronograph always keeps your system's clock/calendar up to date.

GAME PADDLES/JOYSTICK INTERFACE for attaching up to four game paddles or two joysticks to the PC.

SPOOL software package uses part of the system's memory as a print buffer. You no longer have to wait for your printer.

SOFTDISK program allocates a portion of the system's memory as a super fast electronic disk drive. Store important information there for speedy access.

SMORGASBOARD PIGGYBACK offers even more expandability. With it another 256K bytes RAM and a 2nd Serial Port become available.

INCREDIBLE LOW PRICE: £299 with 64K installed; £399 with 128K, £499 with 192K and £599 with 256K. SMORGASBOARD comes with a one year warranty and is documented in English, French and German.

SEE IBM DEALERS EVERYWHERE. If yours doesn't stock SMORGASBOARD yet, have him contact Kensington Microware or one of our distributors—Ferrari Software 01 751-5791 or Softsel Computer Products 01 844-2040.

Kensington Microware Ltd. 919 3rd Avenue NYC, NY 10022
Tel. 212 486 7707 Telex. 236200 KEN UR

KENSINGTON MICROWARE
NEWS
from SPECTRUM
Sensational TEXAS OFFER!
Fantastic reductions & offers on the TEXAS TI-99/4A see our ad. on next double page for details.

PRESTEL
See PRESTEL Page 600181 for up to date information from SPECTRUM

NEW SPECTRUM MEMBERS
Check our address page! - there are many new SPECTRUM dealers throughout the UK so there's a good chance there'll be a SPECTRUM centre near you.

INTRODUCING SPECTRUM FACTS!
Next to many of our offers, you'll find a few lines tagged SPECTRUM FACTS. We pride ourselves on providing you, the customer, with a genuine service as well as super LOW prices, and we want you to know that when you buy from a SPECTRUM dealer, you'll get exactly the right micro for your needs. SO LOOK OUT FOR YOUR SPECTRUM FACTS!

AFTER SALES CARE
SPECTRUM service centres will ensure that should your machine 'go down' we will get it running again as quickly as possible. We also offer extended warranties at reasonable prices too - ask your SPECTRUM HOME COMPUTER CENTRE for full details.

COMPUTER DEALERS
The SPECTRUM dealer list is virtually closed. If your area is free and you'd like to join the waiting list, please write to MIKE STERN, SPECTRUM (U.K.) Ltd, Barrowdale, Walwyn Garden City, Herts.

BBC Model 'B'
Yes, this top selling Micro system is now available from your local SPECTRUM dealer - the BBC Model 'B' offering 32K RAM plus a full back-up of peripherals & software tool. It's an infinitely expandable machine, ideal for the home or business and is already widely used for educational purposes in schools - so the chances are your children may already be well familiar with its operation, which must make it the ideal choice for the home too! So if you're thinking of buying a micro you must take a look at the BBC at your local SPECTRUM dealer NOW! - but just one word of warning, initially stocks will be limited and demand is bound to be great, so please phone to check the stock position before making a journey.

SPECTRUM FACTS
Maximum user RAM: 47,870 Bytes
Text screen: 28x40
High resolution graphics: (background can be displayed at same time) High resolution graphics User definable Graphics
Cassette Lead: Included

Please Note!
We regret that there is a tremendous shortage on all BBC equipment - please phone your nearest store before making a journey to check stock position.

SHARP MZ-80A
Desk top genius! The all-in-one SHARP MZ-80A. Ready to run the moment you get it home. Built-in keyboard, CRT, 17" display and cassette data storage with 4K Byte ROM, 48K Byte RAM, 2K Byte Video RAM. The BASIC with extra useful additions, offers quite a powerful micro for the home or business. ASCII profiled keyboard, numeric pad. 2 page Video RAM allows screen to be scrolled up or down. CP/M available.

ORIC-1
A superbly designed and engineered micro and great value-for-money from SPECTRUM. Offering 48K RAM Colour - (8 foreground and 8 background can be displayed at same time) High resolution graphics User definable Graphics. Full sound (6 octaves of controllable sound) Easy to use keyboard with moving keys. Standard Centronics parallel interface allows easy connection to a wide range of printers etc.

Spectrum Price
SPECTRUM FACTS
Maximum user RAM: 47,870 Bytes
Text screen: 28x40
High Resolution: Included
Cassette Lead: Included

ORIC-1 Price
Spectrum Price

Not all stores carry every advertised item, please phone before making a journey - Prices correct at time of going to press E.A.O.E.

BBC 'B' with Disk Interface £470.50
BBC Disk Interface Kit £95.00
BBC Single Disk Drive 100K £265.00
BBC Dual Disk Drive 200K £302.85
BBC Tape Recorder £29.90
BBC Acorn Software Cassette based from £9.95
BBC Disk based software £11.50

Spectrum Price £399.00 INC. VAT

Spectrum Price £546.25 INC. VAT

Spectrum Price £169.95 INC. VAT
**LYNX**

Just look at this super new LYNX Micro - an incredible 16K & 32K video ram and that’s expandable up to or beyond 96K. For just £225.00 INCLUDING VAT the LYNX is exceptionally versatile. All LYNX’s "add-on" connections are standard types. The high definition colour graphics make it a top value choice for the home or office (with expansion the LYNX can become an 80 character - per - line word processor)! Take a look at the LYNX - a memorable bargain from SPECTRUM. But please phone to check stock position before making a journey as this machine is bound to be in great demand.

**SPECTRUM**

**LYNX ZX-81**

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Bookshop</td>
<td>£49.95</td>
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<tr>
<td>Software for Sinclair</td>
<td></td>
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<tr>
<td>Computers</td>
<td></td>
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<tr>
<td>Bumper 7 1x ZX81</td>
<td>£6.95</td>
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<tr>
<td>1x Super You ZX81</td>
<td>£7.95</td>
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<tr>
<td>Labyrinth 16x ZX81</td>
<td>£5.95</td>
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<tr>
<td>Supreme Pro (including 16x ZX81)</td>
<td>£3.95</td>
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<tr>
<td>16x ZX81 Compendic</td>
<td>£5.95</td>
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<td>16x ZX81 Recursive System</td>
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<td>16x ZX81 Triple v 16x ZX81</td>
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<td>Spectro Lambo/Rescue</td>
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<td>Breakout 16x ZX81</td>
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<tr>
<td>Magnitox 16x ZX81</td>
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<tr>
<td>Magnitox 16x ZX81</td>
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<tr>
<td>Football Manager 16x ZX81</td>
<td>£7.95</td>
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<tr>
<td>Cassettes for ZX81 Type-10</td>
<td>£3.95</td>
</tr>
<tr>
<td>6 Games</td>
<td></td>
</tr>
</tbody>
</table>

**SPECOGEN NICKLE**

A truly reliable micro and highly recommended by SPECTRUM featuring powerful and sophisticated COLOUR GRAPHICS, allowing you to create full 8 - colour Games, Diagrams and charts quickly and simply. Powerful 16K RAM memory (expandable internally to 32K) for FULL COLOUR video games and POWERFUL COMPUTING with a full range of inexpensive accessories: 16K RAM pack, Joy sticks for games, Light Pen, Disk Drive and a Printer. The superb Colour Genie is at SPECTRUM now - check it out and see the Genius at work!

**SPECTRUM**

**OKI MICRONLINE Printers**

Now from SPECTRUM - this top selling range of printers renowned throughout the world for their quality and reliability. If you’re thinking of adding a printer to your micro then you must take a look at the MICROLINE range at SPECTRUM NOW! they’re fantastic value - for-money

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>MICROLINE Model 80</td>
<td>£259.90</td>
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<tr>
<td>MICROLINE Model 82A</td>
<td>£455.40</td>
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<tr>
<td>MICROLINE Model 92P</td>
<td>£585.35</td>
</tr>
</tbody>
</table>

**SMITH CORONA**

Model TP-1

Microprocessor-controlled, high quality dot matrix printer at a LOW cost from SPECTRUM Serial, Parallel or IEEE Interface - Spectrum LOW Price £557.75

**MORE SPECTRUM LOW PRICES**

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.
A truly amazing offer on this expandable & Comprehensive top-of-the-line Micro.

Yes, now from SPECTRUM the fabulous TEXAS TI-99/4A Home Micro at a super NEW LOW PRICE - Plus! a super FREE! offer too! When you return your FREE OFFER VOUCHER obtainable at time of purchase to TEXAS INSTRUMENTS they will send you absolutely FREE! a PAIR OF JOYSTICKS - worth £24.95. A beginners BASIC TUTOR PROGRAM -Worth £9.95 and a CONNECT 4 PROGRAM - Worth £15.95. TOTAL VALUE £50.85 (which means you’re effectively only paying £99.10 for your TEXAS TI-99/4A micro.) A fantastic offer - HURRY to your local SPECTRUM dealer NOW and see for yourself just what great value this really is. Offer closes June 30th.

Super NEW LOW PRICES on TEXAS SOFTWARE from Spectrum too!

The Spectrum top 30

Connect Four £15.95
Zero Zap £15.95
Attack £15.95
Blasto £15.95
Huntie £15.95
Yahzee £15.95
Hangman £15.95
T.I. Invaders £19.95
Almaizing £19.95
Wumpus £19.95
Carwars £19.95

Oldies but Goodies £12.95
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Tomb Stone City £24.95
Munchman £29.95
Chess £39.95
Parsc £29.95
Alpiner £29.95
EDUCATIONAL GAMES £27.95
Dragon Mix £27.95

Adventure & Pirle £29.95
Adventure Land £19.95
Mission Impossible £19.95
Voodoo Castle £19.95
The Count £19.95
Strange Odyssey £19.95
Mystery Funhole £19.95
Pyramid of Doom £19.95
Ghost Town £19.95
Golden Voyage £19.95

PLUS! SPEECH SYNTHESISER or TI CASSETTE RECORDER each worth £49.95

FREE! when you buy any 6 Texas Software modules.

An additional BONUS OFFER from SPECTRUM! Purchase 6 (or more) TEXAS software modules - send your receipt to TEXAS INSTRUMENTS and you’ll receive a FREE SPEECH SYNTHESISER or a TEXAS TI CASSETTE RECORDER each worth £49.95 -ask your local SPECTRUM for details NOW!
Unbelievable but true!

TI-99/4A Micro Offer!

Specifications for TEXAS TI-99/4A.

Console CPU: 9900 Family, 16-bit microprocessor, plus 256-byte scratchpad RAM.
Memory: Total combined memory capacity: 110 KBytes. Internal ROM memory supplied: 26 KBytes. External ROM memory: (Solid State Software command modules) up to 36 KBytes each. RAM memory supplied: 16 KBytes (Expandable to 48 KB).
Keyboard: 48 key QWERTY with control and function keys (user definable), full upper and lower case capability, alpha lock, auto repeat.
Sound: 5 octaves, 3 simultaneous tones plus noise generator. Each tone controllable in 1Hz steps from 110 Hz to beyond the audible range.
Colours: 16 foreground and background colours.
Video resolution: 192 x 256 (24 x 32 characters).
Power: 240V - 50Hz - 25W in separate power supply unit.
I/O: UHF modulated PAL colour signal for UK TV receivers.
I/O: UHF modulated PAL Colour signal for connection to your own TV Interface for up to 2 domestic audio cassette recorders. 44-pin peripheral connector-up to 3 peripherals attached simultaneously. System memory and address signals available at peripheral connector. Interface for 2 Wired Remote Controllers.

SPECTRUM SENSATIONAL PRICE - NOW ONLY £149.95 INC. VAT

MORE SPECTRUM LOW PRICES
### SOFTWARE Selection

**THORN EMI**
- Software for Atari
- Atari 800
- 801
- 802
- 803
- 805
- 807
- Spectrum
- Spectrum 48K
- Spectrum 48K
- Spectrum 48K

**SANTO**
- Disk head cleaner
- 801
- 802
- 803
- 805
- 807
- Spectrum
- Spectrum 48K

**SANYO**
- Colour Monitor
- Text Screen
- High Resolution
- Cassette Lead

**SPECTRUM FACTS**
- Play Extended Microsoft colour BASIC (as standard)
- Unbelievable value from SPECTRUM!
- Extensive facilities include highly advanced colour graphics. Powerful standard 32K RAM (expandable to 64K). 40 Colour & 6 monochrome display. Extended Microsoft colour BASIC (as standard) Advanced sound with 805 tones
- Spectrum
- Maximum user RAM...

**SPECTRUM Price**
- £399.99

**ACCESORIES, BOOKS & GAMES for ATARI**

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
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<tbody>
<tr>
<td>Accessories</td>
<td>£19.95</td>
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<tr>
<td>Thermal Printer</td>
<td>£19.95</td>
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<tr>
<td>40K RAM Pack</td>
<td>£16.95</td>
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<tr>
<td>400 Keyboard</td>
<td>£29.95</td>
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<tr>
<td>32K RAM board (400/1600)</td>
<td>£24.95</td>
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<tr>
<td>48K RAM board (480/1600)</td>
<td>£29.95</td>
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<tr>
<td>Pac-Wars</td>
<td>£19.95</td>
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<tr>
<td>Joysticks</td>
<td>£29.95</td>
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<tr>
<td>Joystick pack</td>
<td>£10.95</td>
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<tr>
<td>Gamepad</td>
<td>£10.95</td>
</tr>
<tr>
<td>Printer Cable</td>
<td>£10.95</td>
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<tr>
<td>Monitor Cable</td>
<td>£10.95</td>
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<tr>
<td>Disk head cleaner</td>
<td>£10.95</td>
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<tr>
<td>Repair kit</td>
<td>£10.95</td>
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<tr>
<td>Word Processing package</td>
<td>£12.50</td>
</tr>
</tbody>
</table>

**ADDITIONAL FEATURES**

- Plus many more at your local SPECTRUM dealer - call in now and see!
COMPUTERS

**Gemini Galaxy 2**

"I would place the Galaxy at the top of my list"
*(Computing Today, April 1983)*

- Twin Z80A Processors
- Serial and parallel printer interfaces
- CP/M 2.2 Operating System
- Cassette and light pen interfaces
- 64K Dynamic RAM
- User definable function keys
- 800K Disk Capacity
- 80x25 Video Display
- Numeric key pad
- 12" Monitor included

Total support for Gemini & nascom Products

**nascom 3 available from MicroValue**

Based around the successful Nascom 2 computer, this new system can be built up into a complete disk based system. Supplied built and tested complete with PSU, Nas-Sys 3 and Nas-Sgra.

48K System

**£549**

(CP/M 2.2)

£100

(NASCOM 2 KIT)

£225

(Built & Tested)

£285

**£1495**

(£1719.24 inc. VAT)

**Total support for Gemini & nascom Products**

80x25 Video for nascom

Nascom owners can now have a professional 80x25 Video display by using the Gemini GB12 Intelligent Video Card with on-board Z80A. This card does not occupy system memory space and provides over 50 user controllable functions including prog character set, fully compatible with Gemini GB05 and GB15/809 Disk Systems. Software supplied on Gemini system disks. Built and tested.

**£125**

(£143.75 inc. VAT)

**FREE SOFTWARE!**

Home budget, bank reconciliation, SPACE INVADERS, STAR TREK, SCRAMBLE, bank loan calculator, mortgage calculator + 7 other games.

Educational - Geography, Maths., Spelling + 4 part BASIC tutorial.

Electronic magnificence from Sharp


**£475**

(£542.25 inc. VAT)

PRINTERS

<table>
<thead>
<tr>
<th>Printer Type</th>
<th>Price</th>
<th>VAT</th>
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<tr>
<td>Epson MX80 Type III</td>
<td>£348</td>
<td>(£399.95 inc. VAT)</td>
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<tr>
<td>Epson MX80 FT Type III</td>
<td>£388</td>
<td>(£445.95 inc. VAT)</td>
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<tr>
<td>Epson MX100 Type III</td>
<td>£496</td>
<td>(£569.95 inc. VAT)</td>
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<td>NEC 8023A</td>
<td>£339</td>
<td>(£399.95 inc. VAT)</td>
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<tr>
<td>SEIKOSHA GP100A</td>
<td>£215</td>
<td>(£246.95 inc. VAT)</td>
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<tr>
<td><strong>Daisy Wheel Printer:</strong></td>
<td><strong>£485</strong></td>
<td>(£557.75 inc. VAT)</td>
</tr>
</tbody>
</table>

*Phoenix P12 Monitor*

A high quality data display monitor, ideal for all Nascom and Gemini systems. 20kHz resolution. Available in amber or green phosphor.

**£110**

(£125.50 inc. VAT)
LOW COST SYSTEMS

NEW! Micro Professor MPF II 64K

MPF II is a most exciting addition to our range. Based on 6502 microprocessor this machine offers 64K of RAM, high resolution & colour graphics, and sound. Standard BASIC interpreter is Applesoft compatible, allowing MPF II to read and write tapes in Apple format. Complete with excellent 600 page manual.

- Micro Professor: £233.92 (£268.99 inc V.A.T.)
- Joystick: £13.00 (£14.95 inc V.A.T.)
- MPF II printer: £161.53 (£185.75 inc V.A.T.)
- Software Cassettes: £4.34 (£4.99 inc V.A.T.)

Dragon 32

A powerful colour computer for under £200.

- 32K RAM
- 6809E Microprocessor
- Extended Microsoft Colour BASIC
- 9 Colour, 5 Resolution Display
- Sound through TV 5 octaves, 255 tones
- Advanced Graphics

Full range of Dragon software available.

Sinclair ZX81

Now available through MicroValue – a real computer for less than £50!

- Sinclair ZX81 Computer: £43.43 (£49.95 inc. VAT)
- ZX81 Learning Lab: £17.35 (£19.95 inc. VAT)
- Software for Sinclair: from £3.43 (£3.95 inc. VAT)

Sinclair ZX Spectrum

Now available from MicroValue!

- 16K ZX Spectrum Microcomputer: £108.69 (£125 incl. VAT)
- 48K ZX Spectrum Microcomputer: £152.17 (£175 incl. VAT)
- Sinclair ZX printer: £52.43 (£59.95 incl. VAT)

Texas TI99-4A

Colour, sound and a typewriter type keyboard for under £160

A truly expandable microcomputer system with a wide range of educational and games software.

- Texas TI99-4A Microcomputer 16K: £139.08 (£159.95 incl. VAT)
- Voice Synthesizer Unit: £43.43 (£49.95 incl. VAT)
- Peripheral Expansion Unit: £120.39 (£140.95 incl. VAT)
- Disk Drive: £278.21 (£319.95 incl. VAT)
- Disk Control board (for above): £165.70 (£189.95 incl. VAT)

ORIC 1

ORIC 1 when used with the ORIC MODEM will allow access to PRESTEL-Viewdata, which has 200,000 pages of interactive information covering sport, travel, hotel bookings, games, etc.

- ORIC 1 48K Microcomputer: £147.79 (£169.95 incl. VAT)
- ORIC 1 Communications Modem: £66.69 (£75.00 incl. VAT)

MICROVALUE DEALERS:

AMERSHAM, BUCKS
Amersham Computer Centre, 18 Woodside Road, Tel: (02403) 22307

BRISTOL
Target Electronics Ltd., 16 Cherry Lane, Tel: (0272) 421196

EGHAM, SURREY
Electrovalue Ltd., 28 St. Judes Road, Englefield Green, Tel: (07843) 3063

IPSWICH
MDW (Electronics), 47/49 Woodbridge Road East, Tel: (0473) 78295

LONDON W2
Henry's Radio, 404 Edgware Road, Tel: 01-402 6822

LONDON SW11
OFF Records, Computer House, 58 Battersea Rise, Clapham Junction, Tel: 01-223 7730

MANCHESTER M19
EV Computing, 700 Burnage Lane, Tel: 061-431 4866

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DUAL WINCHESTER DISK DRIVE SYSTEM
WITH REMOVABLE CARTRIDGE
AVAILABLE IN 10, 20, AND 50 MB VERSIONS

Host adaptors available for:
APPLE; LSI-11; MULTIBUS; S100; TRS80; PET;
MOTOROLA6800; IBM; STD BUS; ALTOS and others

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Please ask your sales staff to contact me □

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TITLE
COMPANY
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TELEPHONE

Post to: GUESTEL, 8/12 NEW BRIDGE STREET, LONDON EC4V 6AL

Now Compsoft announce Delta – the very powerful, very friendly database* that the world has been waiting for.

* For micro computers with CP/M, MPIM or MSDOS operating systems. Including IBM PC.

If part of your microcomputer’s job is to store information, you need Compsoft’s software.

Compsoft DMS is already Britain’s No. 1 record keeping program. And with 4000 users to our credit, we can honestly say we know more about information storage & retrieval than anyone else. We listen to your comments & requests and now we’ve produced a world first – the Delta – a true transactional database.

If you’d like to know more, we have general brochures, full technical specifications & free guides to DMS handling a multitude of business situations from order processing, invoicing & stock recording, through to library, personnel & hospital record management.

Find out more about the database revolution. Either telephone the office or clip the coupon now.

Compsofts Delta – taking microcomputers into the third dimension.

Please send me further details

Company

Contact

Address

Tel No.
The printer that thinks it's a computer!

FACT With internal microprocessor, 8K buffer store and total compatibility, the Ricoh Flowriter range has proved itself the most intelligent and reliable range of printers on the world market.

FACT Ricoh Flowriters can assume the characteristics of any popular 'intelligent' printer and plug into any hardware configuration.

FACT Ricoh Flowriters perform all your processing and printing needs while leaving the host computer free for other work.

FACT Ricoh Flowriters do all this, give you exceptional print quality, yet cost the same as ordinary daisy wheel printers!

FEATURES
- Internal microprocessor
- 8K buffer under full program control
- Includes RS232, Centronics and IEEE 488 interfaces
- 60cps print on the RP1600, 37cps on the RP1300
- Qume, Diablo and NEC Spinwriter wp commands-compatible
- Auto-bidirectional and logic seeking high-speed printing
- Graphics capability down to 1/120"
Three out of every four computers going into schools are BBC Micros. Is there a lesson to be learned by every user?

As part of the current government subsidised scheme aimed at introducing micros to schools, the Department of Industry undertook a survey of machines available and made recommendations to education authorities all over the country.

The BBC Micro met their priorities exactly: it is economical yet fast and powerful, and it can justify the investment involved, through its capability to grow with the needs of the user and with the rapid changes in technology.

Teachers and education authorities agreed, and today it represents over three-quarters of all micros being ordered for schools across the country under the DOI scheme.

The BBC's choice too.

In choosing a machine to put their name to for their massive Computer Literacy Project, the BBC had the same set of priorities as the DOI. The BBC Micro is now an integral part of that project, which includes books, software, courses and a number of major television series, one of which, "Making the Most of the Micro" is now being broadcast.

All this for only £399.

The BBC Micro is light and compact. It generates high resolution colour graphics, and is capable of synthesising music and speech using its own internal speaker. The keyboard uses a conventional layout and typewriter feel.

The most sophisticated version (called Model B) is available for only £399. (There is also a basic model available, the Model A, at £299.)

Designed to grow.

Last year the magazine "Which Micro?" said that the most attractive and exciting feature of the BBC Microcomputer was its 'enormous potential for expansion'.

This is indeed one of the features that sets it aside from the competition.

For example, as well as interface sockets to allow you to connect to a cassette recorder, and to your own television, you can also use video monitors, disc drives, printers (dot matrix and daisy wheel) and paddles for games or laboratory use.

You can also plug in ROM cartridges containing games or specialist application programs.

The Tube. A unique feature.

The Tube, which is unique to the BBC Micro, provides for the addition of a second processor via a high speed data channel. The possibilities are enormous. For example, the addition of a second...
3MHz 6502 processor with 64K of RAM doubles processing speed. While a Z80 with 64K of RAM opens the door to a fully CP/M* compatible operating system, with all the benefits for business applications.

Linking up with other computers.
The BBC Micro also offers a facility of immense potential value to schools, colleges and businesses. It's called Econet—a system which uses telephone cable to link with other BBC Micros. A number of machines can then share the use of expensive disc drive and printer facilities.

Make full use of Prestel & Teletext.
With special adaptors you will not only be able to turn your TV set into a Prestel terminal and Teletext receiver, but you can also take data and programs direct from these services. (The programs, which are known as telesoftware, are already being broadcast by BBC's Ceefax service.) This is another first for the BBC Micro.

BASIC plus.
A sophisticated version of BASIC has been chosen for the BBC Micro, which incorporates features normally found only in more advanced high level languages. However, there is also a facility allowing access through a simple command to another language—for example, PASCAL, FORTH and LISP.

A full range of software.
Applications software for the BBC Micro already cover a very wide field. Packages covering games, education and business applications are available on cassette. All developed to the same high standards set by the hardware.

The best possible back-up.
Your BBC Micro comes with the backing of the BBC and an extensive dealer and service network. Each approved dealer is able to offer advice and carry out expansion work and repairs.

<table>
<thead>
<tr>
<th>BBC Microcomputer – Model A and Model B.</th>
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<tbody>
<tr>
<td>2MHz 6502A Processor.</td>
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<tr>
<td>32K ROM; 16K RAM Model A, 32K RAM Model B.</td>
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<tr>
<td>Full QWERTY keyboard with 10 user-definable function keys.</td>
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<tr>
<td>Mixed high resolution graphics and upper and lower case text.</td>
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<tr>
<td>300 baud and 1200 baud interface for standard cassette recorders.</td>
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<tr>
<td>Three-voice music synthesis with full envelope control feeding internal loudspeaker.</td>
</tr>
<tr>
<td>Interface sockets (Model B only) – RS423, for analog inputs centronics and user port.</td>
</tr>
<tr>
<td>6502, Z80,16032 second processors.</td>
</tr>
<tr>
<td>Single and Dual Disc Drives with 100 and 800 K-bytes storage.</td>
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<tr>
<td>Teletext unit.</td>
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<tr>
<td>Speech synthesis.</td>
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<tr>
<td>Networking facility – via Acorn Econet.®</td>
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How to buy your BBC Micro.
If you are a credit card holder and would like to buy a BBC Micro B, or if you would like the address of your nearest stockist, just phone 01-200 0200.
Alternatively, you can buy a Model B directly by sending off the order form below to: BBC Microcomputers, c/o Vector Marketing, Denington Estate, Wellingborough, Northants, NN8 2RL.
All orders are despatched by fully insured courier and come complete with easy to follow 500 page User Guide and Welcome cassette.

To BBC Microcomputers, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.
Please send me __________ BBC Model B Microcomputers at £399 each, inc. VAT and delivery. I enclose PO/cheque payable to Acorn Computers Limited Readers A/C or charge my credit card.

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Name
Address
Postcode
Signature

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Designed, produced and distributed by Acorn Computers Limited.
If only he’d bought a Commodore computer.
1981 was a record year for the businesses of Great Britain. More than eight thousand went under. And not just small ones, either.

So what can you do to keep your business in the swim? There’s no great secret of success, but for a start, you’ll need to look for ways to make better use of your resources. To cut down on your overheads. To keep your cash flowing.

It’s often a struggle. Even with the best will in the world, it’s so easy to get bogged down in bureaucracy. Paralysed by paperwork.

In cases like this, Commodore really comes into its own.

Being one of the biggest micro-computer companies in the world, we’ve probably done more for businesses than anyone else in our field. Making them more efficient. And more profitable.

Our range of computers, our vast selection of specialised programs and our countrywide network of dealers are unrivalled.

Now we’ve developed a new generation of computers to put us even further ahead. The Commodore 700 series.

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The 700 series’ revolutionary design includes a keyboard that is separate from the display unit. A display screen that pivots and tilts, integral disk drive and keys that are sculptured for ease of use.

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There are two further things worth remembering about the 700 series.

It has a staggering memory capability. A RAM of 128k up to 896k. (For the layman, that’s a massive amount of memory.)

And an equally staggering price. (The 700 series starts at £995.)

Commodore almost certainly have a program to fit your needs. If not, a software package can be specially designed for your business.

All this means that, for relatively little outlay, the 700 series can help make your business a lot more efficient and profitable.

In other words, instead of sinking, you could be swimming all the way to the bank.

**The 700 Series.**
We felt it was time we stopped telling you about ourselves and said a few words about the massive commitment which over 100 software organisations have made to the ACT Sirius 1. On these pages are just a few of more than 400 packages now available for the Sirius 1, Britain's best-selling 16-bit personal computer.

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If you’re looking for a computer solution to match your business requirements, then ‘phone one of the numbers above, before you look any further. They’re all convinced that the ACT Sirius 1 is the best machine of its kind in the country—and they have the software that will make it work for you. And if you don’t see what you want, just clip the coupon for details of more than 400 products designed for the ACT Sirius 1.
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**BETTER TRAINING**
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Only PULSAR is available through the unique network of PULSAR Software Centers. These are hand-picked computer dealers who handle a range of personal computers but who specialise purely in PULSAR to meet all business needs.

**THE PULSAR RANGE**

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Although the NewBrain is conceived as a total system, the unexpanded Processor itself has a great deal to offer. It is available in two forms: Model AD, shown below, with a built-in line display; and Model A, without the line display. Both models can operate with a monitor or a television set.

**MEMORY**
- 24K bytes of ROM;
- 32 bytes of RAM, at least 28K of which is available to the user.

**THE SCREEN DISPLAY**
- 40 or 80 characters to the line - without affecting the 28K bytes of RAM at your disposal;
- 24 or 30 lines to the screen;
- well-formed characters, with true descendents;
- a full European character set;
- normal or reverse video, high resolution graphics on screen of controllable size, 256, 320, 512 or 640 horizontal resolution by 250 vertical lines;
- a facility to set up a "page" of up to 255 lines, with the screen acting as a "window" to display it;
- ability to maintain several such pages simultaneously, and to switch rapidly between them;
- text may be used on graphics screen as well as on parts of the video screen not used by graphics.

**CHARACTER SET**
- 512 characters, including the full ASCII set, all European accented characters, Greek and graphics symbols.

**GRAPHICS**
- 20 powerful graphics commands;
- all text characters usable on the graphics screen;
- variable-sized graphics screen, with the rest of the screen available for text - for versatility and to save memory.

**SOFTWARE**
Enhanced ANSI BASIC; screen editor (32 commands); mathematics package (10 significant figures); graphics commands.
- a very friendly screen editor - a delight to use and readily adapted to text processing;
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- a powerful, much enhanced BASIC;
- a very flexible operating system, which allows any data stream to be opened to any device.

**INTERFACES**
- two tape cassette ports built into the processor unit;
- a built-in printer interface;
- a built-in communications interface (V24/RS232);
- a video monitor interface;
- a TV interface;
- an expansion interface for NewBrain system expansion modules.

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- Standard cassette deck used in conjunction with the OCTET-TI. Supports most standard cassette tapes which are available from Duplex Communications Ltd. Facilitates data block counter and 5 pin DIN socket for data read and write. High speed, high density, storage eg standard C15 tape will store approximately 112,000 chars.

**OCTET-TF**
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**OCTET-EI**
- IEEE to RS232 converter for PET microcomputer.
- Connects to OCTET-KSR and MSR interfaces.
- OCTET-EI interface dimension 4” X 7” X 2.5”.
- Unidirectional unit with facility to daisy chain a disk drive/printer.
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- GENERAL PURPOSE DEVICE; can be used between PET and any RS232 device.

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Full details from sole suppliers: Duplex Communications Ltd and Duplex Communications (South) Ltd

**DUPLEX Communications**

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The MegaPlus™ has three functions standard: Parity checked and fully socketed memory up to 256k in 64k increments; clock/calendar with battery back-up for automatic loading of time and date when the computer is turned on; and an asynchronous communication port (RS232C serial) which can be used as COM1 or COM2. (DTE for a printer, or DCE for a modem). Optional is a 100% IBM compatible parallel printer port, and a second asynchronous port for another £30 each. The MegaPak™ option plugs onto your MegaPlus™ "piggyback" style to give you 512k of additional memory. Now you can create disk drives in memory up to 360k, set aside plenty of space for print spooling, and still have memory for your biggest programmes.

I/O-PLUS 2 WITHOUT MEMORY

The I/O-Plus 2™ comes standard with a clip-on battery powered clock/calendar, and asynchronous communication port (RS232C serial). Optional is a second asynchronous port (DTE for a printer, or DCE for a modem), a parallel printer adapter, and the best game paddle adapter on the market. What's so special about our game adapter? Not only is it an IBM standard game port, but it can also use low cost, widely available Apple compatible paddles and joystick. If you already have sufficient memory the I/O-Plus 2™ gives you all the input and output ports you might need for less than the cost of most single function boards.

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SuperDrive™ disk emuilation software creates "disk drives" in memory which access your programmes at the speed of RAM memory. SuperSpooler™ print buffer software allows the memory to accept data as fast as the computer can send it and frees your computer for more productive work. Some manufacturers sell hardware print buffers that do only this for hundreds of pounds. SuperSpooler™ eliminates the need for these robotic products. Both of these powerful pieces of software can be used with any expansion memory for your IBM PC or XT.

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Disk-Edit loads a segment of a disk or file into its internal memory buffer. It displays a window into that buffer on your screen. Through the left-hand pane you see the hexadecimal representation of each byte in the buffer. Through the right-hand pane you see the ASCII representation of those same bytes.

Once you are in the Disk-Edit window, you have a full range of text editing commands at your control, including forward space, back space, next line, previous line, view next screen, view previous screen, beginning of file, end of file, string searching, write to disk, and several others.

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<th>Software</th>
<th>Country</th>
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<tr>
<td>WORDSTAR</td>
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<td>SPELLSTAR</td>
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<td>EASYWRITER II</td>
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<td>EASYSPELLER II</td>
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### Data Bases And File Management Systems

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<th>Software</th>
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<td>DATASTAR</td>
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<td>SMS-80, 81, 82</td>
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<td>INFOSTAR</td>
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<td>PERSONAL PEARL</td>
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<td>RESCUE</td>
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### Business Systems, Financial Planning, Accounting

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<td>CALCSTAR</td>
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<td>Sorcim</td>
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<td>MILESTONE</td>
<td>Organic Software</td>
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<td>GBS/General Business System</td>
<td>ByteSoft</td>
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<td>ISL (Integrated Stock &amp; Ledger)</td>
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### Statistics

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<td>MICROSTAT</td>
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### Programming Tools (Inc. Cross Assemblers)

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<td>XASM8F (28/3870)</td>
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### Operating Systems

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### Utilities

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<td>SDISK (Silicon Disk)</td>
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### Communications

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### Graphics

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The time has come to write a column again. I'm dealing with accounting systems because they provide the most complex of installations. Now, before you shop, ask whether your own manual systems are good but overworked or whether you are looking for a computer system with which to set up a new accounting procedure. If the former, you should have few problems changing to a computer system. If the latter, be prepared for hard work putting your house in order before computerising. The old adage of GIGO – garbage in, garbage out - applies nowhere more than in ill-thought out implementations of accounting systems.

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Next time I'll ramble on about Database systems. Before that KGB are exhibiting at COMPUTER FAIR, Earls Court, 16th-19th June so drop in and see us.

Sandy Saunderson

Sandy Saunderson is Managing Director of KGB Micros Limited, the fast growing commercial microcomputer company based in Slough. He has extensive knowledge of the microcomputer industry and if you would like to speak to him, either on general computer matters or particularly about his own products at KGB, give him a call on Slough (0753) 36581/36319 or drop him a line at KGB Micros Limited, 14 Windsor Road, Slough SL1 2EJ.
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Apple is not feeling the pinch here, but that is for two reasons: first, it makes its UK machines in Ireland, and second, IBM is not sold nearly as aggressively here as it is in America.

In America, the statistics (courtesy of Portia Isaacs’s Future Computing seminar company) show that IBM is selling comfortably twice as much as everything else put together. Dealers are being supplied with 70 per cent of what they want on an allocation system.

In Britain, Commodore comes first, still, with ACT’s Sirius catching up fast. Apple has a greater number of machines already sold than Sirius, but the turnover per month is shifting from both Commodore and Apple to ACT.

But Commodore has fallen in love with the VIC and the 64, and seems unbothered by the business micro business. So it is really up to Apple and our own embryonic Future Computing to offer IBM any serious competition. And from Apple’s point of view, nice though the IIE is, it still isn’t what it ought to be, nor is it the price it ought to be.

Digital Equipment, the only other company which could have impeded the IBM tidal wave, appears to have abandoned the project in all but name.

Its Rainbow, announced this time last year, would have been a wonderful machine this time last year because it had the same 8088 chip as used by Sirius and IBM, but with the Z80 in addition. At the time, there was lots of Z80 software, and no 8088 software.

This is no longer true. Despite having totally thrown away its advantage, DEC remains arrogant and secretive about the machine, proprietorial about its software (you can buy Rainbow software only from DEC and use it only with DEC-supplied blank disks) and unsupportive to the micro trade, with whom it openly plans to compete by selling direct to corporate buyers.

At the time of writing, I still haven’t been able to see a Rainbow. And its big brother, the Professional, with a £1000 extra on its price tag, is just an inhouse joke to keep the faithful happy.

Anybody who can recall the nice things I have said about the DEC micros in this column — please forgive me, and pretend it never happened.

Lipsmackin’...  

As an aside to my analysis of Apple’s future problems, it is fascinating to see that that company has appointed a real expert to take over the corporate direction.

In place of ‘Mike’ Markula (the marketing and financial man who helped set up Apple with the two inventors, Jobs and Wozniak, and who is now retiring), Apple has managed to hire the president of PepsiCo’s soft drinks division, a man called John Scully.

Money (according to an interview in the Wall Street Journal) was apparently not the prime consideration in attracting Mr Scully to this job.

From the WSJ report, it’s a bit hard to deduce what the attraction actually was. His praise for Apple is limited to the rather extraordinary observation that: ‘I see the computer business where the

Husky ‘will be demonstrating its indestructible computing power’, says my latest-received press announcement, ‘to a deadly Amazonian piranha, immersed in a tank of water at UCSL Microsystems’ stand at Hanover.’

Both computer and deadly fish will share the tank. It’s nice to show this computer again, because with 144 bytes of internal memory, it remains the only truly portable system capable of being used on an aeroplane. Anything less, and you run out of memory quite quickly.

It is made by DVW Microelectronics, on 0203 668181.
An open letter to Chris Curry, boss of Acorn

Dear Chris,
What on earth is going on? Your company is (at last) producing BBC Micros at a good rate — not quite fast enough to please everybody, but enough to have sold nearly 90,000 machines, and most of those since Christmas. It is about to undertake the incredibly difficult jump from the UK to America, and is also planning to launch a 32-bit add-on, plus a cheap Electron version.

They are nice machines. But when we journalists got so excited about the BBC Micro, there were lots of other things that made the whole package sound nice. And where are they today?

One can buy disks, of course. Sometimes, with a lot of luck, one can buy Acorn disks. There aren't too many of those, which is a bit annoying since we all expected to have them freely available in May. May last year, that is.

And other people's disks are just a wee bit useless, since the Disk Filing System (DFS) chip which you plug into the computer is simply not to be had for love or money. Why not?

Could it have something to do with the fact that a business friend of mine, with six BBC Micros, finds that he has six separate versions of the DFS chip?

Lucky old me, I naturally got priority on a DFS and drive, so that I could write about it. I'd feel the honour a bit more if I could diagnose the faults on the system. And this might be easier if I had the disk operating system manual — the one I have been promised six times since I got the disk last year — but that has somehow still not quite got posted.

As a writer who gets an honorary micro, I suppose I shouldn't expect to get priority on scarce documentation — however, my friends and acquaintances who pay money don't seem to have any better luck.

You may remember one of them wrote a very detailed letter to your company, listing the number of times he had ordered various things, had his money banked, and had received not so much as an acknowledgement.

In Britain, Acorn is promising its 32-bit system in summer. In America, Inner Vision showed a system using the Zilog eight-bit Z80 plus the National Semiconductor 16032 (a 32-bit chip) — and it was built on an $100 card, available now. So the Sord prediction is roughly in line with what we know to be going on in the world.

Sord also announced a local area network, of course.

Not too many of the new CP/M systems will appear in the shops before August, because although the company is now making 6000 machines a month (and a fair proportion of those with disks) there are some prior orders to fill with initial factory output.

However the price for a basic, one-disk CP/M system with display and printer will be under £700 — that is with 200 kbytes of disk storage. It is a keen price. A bigger system — two disks, at 800 kbytes each — will fetch £1200.

You may also remember that he sent me a copy of this letter, and mentioned to your company that he had done so. And you may remember that the fur flew, or so I was told, and important executives got straight on to him and promised to sort it all out inside the week.

Would it surprise you to hear that he still has received nothing from Acorn (six weeks later)?

I know something is happening, because when I rang to try finding out why, I was told that, under a new policy, I can only ask questions through your press agents.

Quite what help this is to me or my various frustrated friends, I can't think.

Chris, I am really worried. I think you know that I wouldn't be writing an open letter unless I was concerned. What is going on? Is it just that your American project has over-stretched your young company? Or is it really the disorganised rabble that your enemies are starting to say it is?

Guy Kewney

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# Sharper Sord

It would be comforting to be able to dismiss as a joke Sord's threat to launch at least two 32-bit micros this year. Unfortunately, the company has the reputation of producing systems on time, and these will almost certainly appear.

A 32-bit system from Sord will almost certainly be a lot more expensive than an 8-bit system, but it will probably be pretty cheap by current standards.

Sord boss Takayoshi Shiina was tantalisingly vague about it all. He would not say which was tantalisingly vague about standards.

Money, as Mr Sculley says, isn't everything. There's the satisfaction of knowing that you can escape, plus the thrill of not knowing what you're doing. Nothing can replace that.

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# Business brain

Grundy has signed a contract with Peachtree. Peachtree has implemented virtually their entire CP/M-based software product range on the Newbrain.

The Newbrain, which is a desk-top/hand-held (as opposed to pocket hand-held) Z80 based micro, was once planned to be the BBC micro — and it was held up for more than a year. Now, with the release of the Peachtree CP/M software, it has caught up with its original schedule.

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# A middle year

One can start off by saying firmly that nobody who goes to see the new computers at the

That's the trouble with BBC stuff — five minutes of original program and all the rest it repeats.
annual Hanover Fair will have to sleep in the gutter. No matter how many people turn up at the airport on the day, somehow they always find a front bedroom somewhere in the city, or near it, or within twenty miles of it, or even on the East German border, where you can spend the night.

But you certainly can't get a hotel room without booking a couple of years in advance. That probably explains, more than anything else, why people who really want to know what the future will bring fail to go to Hanover each year.

Certainly it is the place to go for finding out what people are planning. And a lot of good ideas are first seen there, which can save a prospective buyer a lot of heartbreak — not because you can hold off from buying something else which is now obsolete, but because you can clearly see just how far away the new reality will be.

This year's Hanover Fair was described by one wise old observer as a 'middles year' — by which he meant not a 'middling' year, but one in between two real years.

Last year, there was a lot of good stuff. Next year, much of the stuff on view this year will be really available.

There follows a roundup of the best computer ideas from Hanover, interspersed with the best jokes (not intentional) from manufacturers who have fallen for their own line in optimistic flannel.

Somehow, the information was a bit hard to hold of. And the only publicity information is normally in German, a language designed for filenames — they don't put spaces between words, so 'input file for January 28' could be a nice (long), legitimate filename — but not for easy buzz-word transfer. Sorry.

All prices are quoted in DM, and the rate assumed is DM3.60 to the pound sterling. You work it out; you've got Basic running, I've just got Wordstar.

**Big talk on the Apple**

Smalltalk is the language on which the Apple Lisa is built — so if you think you've never heard of Smalltalk but have don't try to manage without) is a megabyte (not disk, note: internal memory).

Not many Apple Its that I have met have an easy way of attaching that much memory. Most get very sturdy about costs.

You also need a mouse (of course) plus a winchester hard disk for bulk data storage, plus a diskette to get new stuff in and out.

Once you have all that, the new wonderful Smalltalk world can be yours for an additional DM1450, and if you want to generate your own integrated assembly language programs, you need a development system which costs as much as a few DM500.

All those warnings given, rush your enquiry to Macie at Beckershoffstr 21, D-4020 Mottman.

Incidentally, the Basis appeared in its big-brother versions, the 208 and the 216, with enormous 8086, Z8000 and 68000 micro chips driving it.

Basis machines are both Apple and CP/M compatible. The company is at 4400 Munster, Postfach 1603, tel (0251) 77169 or 710745.

**Mad optimism**

MAD computer launched the MAD computer at Hanover. So did Corona launch the Corona. In both cases, the real message was simple: not 'here is a computer' but 'we're about to take Europe seriously'... with means that people will start trying to get the machine into their shops.

The MAD computer has impressed people who have seen it (it is vaguely IBM-like) because of the unrestrained claims that founder John Nafeh has made for his design.

He says that this 'revolutionary software will transform the entire understanding of small computers and their programs', which means that nobody yet knows how to use it. And he adds that 'we're talking about major changes that are as near as 18 months away', which means that none of the people working on the software have yet been able to give a realistic estimate of when they're likely to finish.

Never mind: perhaps he really means it, and one day it will be wonderful. By the end of the year, he says, he will be producing 25,000 systems a year. I deduce, therefore, that until the end of the year, he will be producing rather fewer.

However, my scepticism is not solely derived from the vagueness of the promotional literature.

It is based on the fact that the 'advanced 16-bit processor' referred to in the glossy literature is apparently going to be the Intel 80186, which is indeed a very advanced chip, and an expanded and glorified version of the 8086, which is the 'big brother' of IBM's (and Sirus') 8086.

It is a lovely chip, compared with the 8088, but nothing I have heard about it included the fact that people would be able to buy thousands before the end of the year. And as for having fully debugged software to run on a system using it...
well, I'll believe that when I see it.
You can ask for details from 3350 Scott Blvd, Building 13, Santa Clara, CA 95051, tel (408) 980 0840.

Pocket Apple
Looking just like any other pocket calculator of the Sharp portable computer variety was a Pocket Apple called the PA-2 Kiwi.
It was shown by the very well-known user group's, Assmann System, subsidiary complete with a parallel disk interface and a disk.
It can also be connected to a real Apple at any stage for transfer of information.
The price for the machine itself, with a piling 8k of memory (expandable to 32 max) is an equally modest DM800. The single disk, including interfacing, costs more than that at DM1000 - but it was a very nice slimline drive.
The display is not one that you will ever use for graphics, because it shows a single line of 16 characters on an LCD screen.
But since the machine includes its own clock (program readable) and an interface either to monochrome or colour tv, the queue for samples alone could be a long one.
Assmann supplies not Applesoft, but Kiwisoft Basic (very similar to my hasty appraisal) plus Pascal, Pilot and Lisp languages.
They can be contacted at the following address: Assmann Informatik 2000 Gmbh, Industriestr 5, D-6380 Bad Homburg 1, tel (06172) 106-1, telex 0415158.

Something to declare
On the subject of portable computers, my own frequent travels through American customs with an Osborne have taught me the following useful lesson: 'when they ask you to open it up, they don't want to see the inside. They want to see the Made in USA plaque next to the on-off switch.
No, I don't know anybody making such stick-on labels for other systems. Sorry.

Link or lock-out
American firm Quadram showed a colour display controller for the IBM micro. It differs from most in allowing 16 simultaneous coloures, and there are versions which considerably expand the detail at which the machine can manipulate pixels.
Rumours of an Apple-link card which will let IBM users run Apple software are exciting, but the company wouldn't confirm it, and there are obvious legal hurdles to clear. Apple tends to take imitators to court, and even if it doesn't always win, it's stupid to count on this in advance.
Quadram is on (404) 923 6666.

IBM black box
A Japanese firm which is pinning its faith on the same humorous iAPX186 Intel chip is Kyocera, a firm which was strangely offended by my admission that I'd never heard of them.
One would think this was natural, since they say that they sell to other people, who put their own badges on the boxes of the Kyocera imitation IBM machines.
The company makes everything from ceramics to chips to circuit boards, and decided the logical thing was to turn these bits and pieces into a computer.
So it showed a super-IBM black box. Its keyboard has a mouse-hole (mice are things for controlling the cursor position on a screen) and the processor has a set of slots which let you plug other, rather cheaper, processors into the back and run them as parts of a network.
Price, they said, was their business. But they assured me that there would be no point in starting the venture if they couldn't do it for a lot less than IBM, even after their customers had put their own badges on and taken their own profit margin.
The company also makes artificial hips, knees, and teeth. Don't write to Japan: they have offices in America and Germany. The German phone number is (07153) 611, and the American phone number is (619) 279 8310.
Corona's arrival at Hanover was more auspicious, since that company is actually shipping IBM compatible equipment. And while I was watching, people from Peachtree came up with diskettes of IBM software, and shoved them into the Corona disk slots, and they ran.

Birthday party
Sometimes it's hard to believe it, but PCW is five years old this year. As Europe's first microcomputing magazine, we got off the ground in February 1978 as a bi-monthly magazine catering for what was then a very obscure hobby indeed.
Now we outsell all the other upset mags by a long margin and there's no sign of the market's expansion rate slowing down.
To celebrate our fifth birthday, we decided we ought to hold some sort of a booze-up. The Reptile House at London Zoo was the unanimous favourite as a venue until we realised that quite a few of us probably wouldn't be let out again. So we held it in the cosmic gloom of the London Planetarium instead with Isaac Newton and Albert Einstein (or, rather, effigies of them) staring disconsolately at all sorts of micro industry persons making idiots of themselves.
And we took advantage of the occasion to present a cheque for £5000 to the winner of the great PCW Manhunt Competition, Mr Stan Higgins, who surprised us all by ringing up with the correct answer when the ink was hardly dry on his copy of PCW!
Peter Rodwell

The PCW 'Gang of Four' - its Editors, past and present. Left to right they are Meyer Solomon - our first Editor; David Tebbutt, Jane Bird - our new Editor; and Peter Rodwell.

Outgoing Editor Rodwell hands over the Manhunt prize of £5000 to winner Stan Higgins.

Compaq, the best-publicised of the look-alikes, is very acid about Corona's claims to be compatible, because Corona has improved on IBM's graphics.
The claim that Corona people make is that they are MS-DOS compatible, which means that when they send a list of instructions to MS-DOS, that program will make their system do exactly what the
"We're creating Miracles"

The Portico MIRACLE microcomputer
a very uncommon portable.

PORTICO TECHNOLOGY LTD.
IBM system would do. But just because they’re MS-DOS compatible it doesn’t mean that the IBM PC will understand all the Corona’s graphics instructions.

Anything which is not bit-for-bit the same is going to (very often) need careful and time-consuming re-writing.

The portable version of the Corona is a great deal cheaper than the portable Compaq. This, said the marketing folk I talked to, is why the Corona power supply will be set up either for European, or for American, voltages. The cooling fan, for instance, just won’t work in both countries. You have to take the old one out, and put in a new one (not an end-user skill at all).

In desk-top computer systems, such thinking is silly. In portable systems, it is plain potty. ‘Here is your computer, and it fits under an airline seat. Just don’t take it too far.’

Exactly what we’ve all been looking for.

**Computer phone**

Toshiba has apparently cracked the problem of making a phone look modern without making it useless to a computer. Most modern phones won’t work with an acoustic modem. Toshiba’s won’t either, but it hardly matters because the phone is just one more peripheral of their latest micro.

The Computer-Phone obviously has a long way to go before it appears on our desks, however. No details of the micro, its data processing abilities, or its price, were available.

**Not so sharpish**

Sharp showed a lovely system with a cheap colour plotter (not printer, plotter).

Actually, Sharp showed several brilliant new machines, and then disappointed visitors by admitting that it ‘knew nothing about their specifications, when they would be available, or their price’.

That is obviously a slight exaggeration. What the company means, of course, is that it will first try to see what the market will stand, and what the likely effect will be on existing machines, before letting these nice machines into Europe.

The M2700, just a keyboard with a tape cassette built in (no display – you have to get a colour tv) had the plotter included in an overall DM1600 price tag. ‘It will appear in the autumn, perhaps September, perhaps October,’ they said on the stand.

Without the plotter or the cassette drive, the price would be DM900. They did say that it would ‘not yet’ run CP/M, but wouldn’t actually say that it would ‘one day’ run it.

The incredibly good display on the X1 model (it had a ‘Galaxians’ look-alike game with fruit and vegetables, all with little grimacing faces, instead of the swooping aliens) can be ‘mixed’ with the output of a video recorder.

This product was so secret that they wouldn’t even admit that the video player was a video player, in case they were tricked into making an admission.

**Joking aside**

Wonderful joke from Jack Tramiel, boss of Commodore: ‘We are the number one micro computer company, our products today include the 500 and 700 range with an add-on processor providing the Intel 8088, MS-DOS, Concurrent CP/M-86, and we are now shipping our new portable version of the Commodore 64.

All that was presumably to make sure his audience realised it was a slightly late April 1st joke. Then came the punch-line: ‘We like Lisa, but it’s just a tiny bit too pricey. So we will produce a machine with all the features of Lisa, for $2000 to $3000, by the end of the year.’

Somebody had the temerity to doubt this, and expressed it by asking whether the software would be ready on time. Software is what makes Lisa-type machines possible, and it is also what makes them impossible, because it is so complex.

There were good reasons to think that the thing might be late. One: at Hanover last year, a hapless Commodore employee promised us that the 700 machine with concurrent CP/M and MS-DOS (see above) would be available last September. Two: despite what Tramiel said (see above) you still can’t get an ordinary 700 in any shop I know of. Three: Apple has been working on Lisa software for four years, and still hasn’t got it right. Four: Commodore lost its best designers late last year, and any super-Commodore replacement under a deal with Zilog can only be six months old. It is just barely possible that the hardware might be in prototype form by now.

And even the portable 64 is something which has been around in photographic form since January, without progressing beyond that to the form of a product which I can take home and test, never mind one which you can go to a shop and buy. And if ever a system was debugged in advance, it must be the portable 64.

So: put your money where your mouth is, Jack and tell us where the software is. ‘We’re showing the software to our major customers,’ said Jack loftily, ‘not the press.’

Heavens, I wonder why.

**Pricey portable**

After the Commodore joke, the Siemens joke fell a bit flat. It takes a certain amount of nerve to offer an ‘IBM compatible microsystem’, and not know whether MS-DOS is available (‘Later this year, we hope,’ said the executive in charge of the display pioulsiy), and it takes even more nerve to admit that when it comes to disks, the company ‘plans’ to have it able to read IBM disks. And when you have a portable version weighing 12kg it is probably sensible to put two handles on it, not just one. But the punchline, that this ‘compatible’ system will cost DM12,000 (the same as the IBM itself) does lack a certain sparkle compared with the idea of a $2000 Lisa machine by Christmas. (Oh, ho ho ho, hee hee hee!)

**Ask a silly question. . .**

IBM’s own joke was a little esoteric. It is the prime contractor to provide the hardware for Germany’s Prestel (Bildschirmtext) service, and it announced, on the second day of Hanover, that it would not be able to deliver the hardware on time. It would not be working until the second quarter of 1984.

But, said IBM earnestly, despite the early delay, after that the project would gradually catch up with the original schedule, and in the end would be completed on time, ‘and as more and more you come to the end of the project in Germany, the delay will become more and more less,’ added the paid optimist.

Then he turned his innocent high-wattage IQ eyes on me.
and asked with palpable puzzlement: 'Tell me, why is it that all English journalists here ask about the Bildschirmitext contract?' I can’t think. Perhaps to take their minds off the Christmas $2000 Lisa (Ha ha, oh, ho ho! Oh, hee hee) from Commodore.

What’s in a name?
Anderson Jacobson launched a Canadian portable which runs IBM software, and is called the Hyperion, in Britain. Because the company is known as AJ to its agents, they decided not to call it the Hyperion, but the Ajile.

Yes, I think so too. Never mind. Within a week, Hyperion’s makers, Bytec, had launched the product themselves in Britain, under the Hyperion name, through Gulfstream.

So I had a nice, quiet little giggle at Hanover, when I found the machine sitting on the AJ stand. It was called the 'A Rogue' (with a G). I totally failed to explain to the AJ man why I was laughing.

IBM users contemplating a move up to the IBM XT when it arrives in the UK should proceed carefully — difficulties exist between the machines which could make the transition less than smooth.

To all intents and purposes the new XT machine is virtually the same as the IBM PC. It has the same keyboard and the same CPU, for example. The major differences are the integral 10 Mbyte hard disk drive, 128k standard main memory and a new 360k floppy drive from Control Data.

Looking inside the machine, though, there are some things to be wary of.

The XT comes with eight expansion slots in total — although three of these will already contain the floppy and hard disk controllers and a synchronous communications board — although it is not clear which three of the slots are shorter than those on the PC. Also, the slots are bunched much closer together. The result of all this is that some cards obtained from independent hardware manufacturers for use on the PC will not be transferable to the XT. And, even if they are transferable the closer positioning of the expansion slots means that the plastic casing may well have to be modified (with a hacksaw or file) to allow the connectors on the XT board to extend out of the back of the machine.

On the other hand, the fact that a board fits correctly, doesn’t guarantee that it’s going to function correctly. In addition to the slot changes, IBM has introduced a new 40k ROM on the XT. This does things like checking how much memory is available and warns a few PC users may come adrift at this point. Some independently produced RAM cards are not supplied with small rocker switches that can be set to indicate to the system how much memory is on board. So the ROM may not be able to read the RAM. (Incidentally, the new XT ROM will not be available as a separate item for installation in the PC.)

The story going around here, is that these boards will most likely be unusable with the XT. Another thing the new ROM will do is check to see if the XT expansion unit is connected to the machine. This new product consists of a second 10 Mbyte hard disk. A similar expansion unit has been designed for the PC as well and this offers essentially the same facilities. The PC version costs $3390 while the XT version costs $2695. (The extra cost of the PC version may be due to the extra circuitry that had to go into the unit.)

In terms of using the XT to run software developed on the PC, there should be less of a problem unless the code depends on the ROM memory to a large degree. In this case, programming may have to be adapted to link neatly with the new XT ROM.

Since the XT is the first IBM machine to feature PC-DOS (MS-DOS) Version 2, the inevitable differences between operating system versions will also have to be dealt with by users.

Executive perks
Osborne didn’t launch the new portable computer — the Executive — at Hanover before I left but, although it was eventually announced there, plans to get it into the European market are way, way behind plans to launch it into America.

The Executive has much more memory than the Osborne I, and uses the newer, more friendly CP/M Plus operating system. It has a bigger screen, and all the other things that people didn’t like about the first model have been improved (except the capacity of the disks which remain at 180 kbytes each) — so a lot of people will be pleased.

But it isn’t yet clear whether the extra board that gives it an 8088 processor (as shown by IBM in the PC) and MS-DOS will be a plug-on, or an add-on, or a separate box. That will be the Executive II.

Neither machine will be freely available in the shops before October in Britain. Theoretically, Americans will get these a long time ahead of us, but in practice they will be in pretty short supply there, for a few months, too.

Price in dollars is $2600. More details next issue.

Inner conflict
Our own Acorn got two nasty surprises out of the West Coast Fair: first, somebody has beaten them at their own game of producing a 32-bit machine, and second, they are going to have to get heavy with somebody who is using the Acorn name.

Acorn’s claim to immortality always rested on the BBC Micro’s ability to withstand the future — to be upgraded, year by year, into the latest design. This year, of course, the latest designs are starting to show the most powerful processor chips, and these have enormous 32-bit data words. That means, where you and I use eight-bit bytes to store things in, and can have up to 255 different characters to choose from in each byte, they have 32-bit words, and can store 2 to the power 32, less one, different characters.

Inner Vision got into this market in a very similar way to Acorn’s proposed 32-bit add-on for the BBC micro. But instead of designing their own computer, they took the foundation of the big one, they just produced a board which any $100 system user can plug in.

The board has a Zilog Z80 with CP/M on it, and next to the nice, familiar chip is the enormous National Semiconductor 16032. Software? Not much, but quite a bit of help for those who want to write their own. The Z80 can be used to write programs for the 16032, and files are stored (for the time being, at least) using CP/M.

Inner Vision sells its dual processor card for $2150, with software costing $600 or so, including documentation. There is a 15 per cent cash discount. Details on (408) 244 8474.

Wizardry
Anybody with two tape cassettes can ‘borrow’ software for the VIC. Not too many people can copy their friends’ plug-in ROM cartridges, which is why the Video Wizard bothered the software industry so much at the Fair.

It is sold as a ‘development system package’ for video games. It simply plugs into your VIC, providing you with the documentation and the hardware needed to develop and test plug-in programs — not just for the VIC, but also for the Atari 400 and 800, the Commodore 64, and also the Atari 2600 and 5200 (whatever they are) — for just $400.

And having developed your game, it then lets you load the software into a permanent memory chip, and plug it into...
Constructions

Anybody who thinks that this is all it will do is crazy: obviously it is mainly going to be used not to develop but to copy existing cartridges.

Full details from Gloucester Computer in Massachusetts on (617) 283 7719.

Obedient Waldo

Waldo is a plug-in card for the Apple that listens to what you say, and then does things like switch on the TV, ring bells, improvise music, turn lights on, etc. With a little luck, the light it turns on will be the one you ask it to. If not, then with luck you will understand what it says in reply.

It costs $600, with a voice unit costing an extra $200, and software controlling up to 256 remote devices costing $70.

Don't ask me if I believe it. I heard it talk, and I believe that it will ring a bell at five o'clock if you set it to do so - but as for how good it will be at listening if you set it to do so - but as for how good it will be at listening to your voice, I refuse to say.

Contact Artina Inc in Arlington, Virginia on (703) 527 0455, and ask them.

Pinball construction

Star software product of the show was certainly the pinball construction kit from Budgoco.

This is already available in Britain through standard games dealers, and to understand how good it is, you need first to have played proper pinball, and then to have played Budgoco's original pinball game on the Apple.

You are given a screen, where on one side there is a blank square, and on the other there is a neat collection of shapes that look suspiciously like pin table furniture - flippers, bumpers, jet bumpers, rollovers, spinners, drop gates, and so on.

With a joystick, you move a little 'hand' icon around the store section, picking up parts and moving them over to the screen. If you like, you can fill the table with bumpers - you can have as many as you like.

Then you can draw pictures, in different colours, and shrink them down to appear on different parts of your pin table as logos. You can set the strength of the springs, the flippers, and the tilt of the table until you have it just right. And finally, you can set the scores.

After all that, playing pinball seems almost an anti-climax.

A prayer answered

Your computer probably needs a computer to help it - especially when sending messages down the phone. Visionary Electronics has built the computer's computer, and now I shall explain why.

There is a silly problem in connecting your computer to the phone: when you do it, you need software running in order to send the coded signals down the wire.

This sounds so obvious it seems silly to mention it: the trouble is that when your computer is running communications software, it can't run a database program.

So, you call up your micro from afar and - with its clever software - it answers the phone, and can transmit information back to you.

But when it becomes apparent that there are 4000 possible names on the database, and you need the database manager to search, you then have the irritating problem of having to unload the communications program to make the search. At that point you lose control of the machine.

Visionary 100 is a little (fairly cheap, around $300)

box which does all the communications work and, with a little more evolution, will actually let you use your own computer when you are somewhere else. Details are available on (415) 751 8811.

No free chips

There are those who will say that the Beebug (BBC Micro users' group) people have been bought off. I won't say that, but only because I know Beebug has not been bought off. Appearances are against them.

The group started a battle with Acorn, saying that the initial versions of the machine were faulty, and that Acorn should provide the replacement part (a memory chip) free to its customers. Acorn insisted on charging £10 for the new chip, unless you 'need it' for things like disks.

Acorn has now come to an agreement with Beebug. This agreement does not, unfortunately, mean that Acorn is no longer charging £10 to replace the chip.

Instead, it means that Acorn supplies the chips to Beebug, which supplies it to members at £5.87 including VAT. The advantages to both parties are obvious: Beebug gets a nice stick with which to recruit from the nearly 100,000 users out there, adding to the 16,000 members it already has, while Acorn relieves itself of the work of distributing the things.

Honesty, I suppose I must admit that I never expected anything different from this battle. There were over 50,000 BBC Micros with the prototype chip in it and, at £10 each, that was half a million pounds to collect. Not the sort of thing Acorn could really expect to write off on the altar of good public relations.

But I find the slightly self-congratulatory tone of the announcements from Beebug and Acorn just a bit sour.

Parting company

North Star, makers of Horizon and Advantage, revealed that for six months or so they have been a subsidiary of a large American conglomerate called TRW.

They also revealed that the deal with UK importer Comart was 'over by mutual agreement' and that they were
**512 x 512 GRAPHICS**

Digisolve offer you a way to increase your graphics speed and resolution. Using a high speed graphics processor, our cards draw lines and characters FAST. The graphics processor works in parallel to the host machine, and gives you the power of using a co-processor specifically designed for graphics. With drawing rates of up to 1,500,000 pixels per second, lines appear instantly to speed up your plotting.

With the resolution, we offer new possibilities for software and systems. No longer is it necessary to consider one of the new 16 bit personal computers because of their better graphics. Digisolve offer a card designed for the Apple II to give 512 x 512 monochrome graphics. With the development of an 80 x 57 line Visicalc and Applewriter pre-boot, serious business users are no longer finding 80 column cards good enough. We also offer a colour unit designed to connect to any computer to give the same resolution but with 64 colours.

Digisolve are committed to the development of graphic systems and character display equipment and have a rapidly growing software base to help you use better graphics.

**APPLE II**

Digisolve’s Apple II High Resolution Vector Graphic Processor Card quadruples the screen resolution and saves using up your Apple’s memory space. The enhanced Applesoft support disc supplied with our card provides the powerful graphics functions and simplifies the conversion of existing software.

* Draws vectors at up to 1,500,000 pixels per second
* 512 x 512 pixels resolution
* Graphics and characters mixed, allows proportional spacing and up to 85 characters by 57 lines of text
* 64K bytes of on board memory will store two pictures for animation or have one text and one graphics page
* 4 different line types for clarity
* Blocks of variable sizes may be drawn to speed up area filling
* Read modify write mode for drawing cursors
* Screen read mode for dumping drawings to a printer
* £399 + VAT + P&P


Turtle Graphics, TASC & Apple Soft software support.

**VGP 64**

Digisolve offer you high resolution colour graphics too. Designed to plug into any computer with a bus host adapter. The VGP 64 gives you 512 x 512 pixels in 64 colours. With its own vector processor and 384 K bytes of memory your computer can become a sophisticated graphics system.

* 64 colours that may be expanded with a palette or extension video RAM card
* 512 x 512 pixels resolution with fast vector processor
* 384 K bytes of video RAM on board
* 2 pictures may be stored simultaneously in full colour for animation
* In monochrome 12 pictures may be stored and selected for display under software control individually or for animation
* Available as a boxed unit complete with power supply, or in board form to OEM customers
* Will plug into Apple, Commodore, IBM, Sage, S100 systems, PDP11 or any computer with a bus
* Available in several versions: 8 colour £799 64 colour £899

**VDU BOARD**

COMING Digisolve offer you the cheapest way to make a scrolling VDU with our intelligent 80 x 24 VDU card. With over 50 control functions the card works at up to 19.2 K baud.

* 80 Characters x 24 lines of text
* Characters are properly formed with descenders
* Block graphics option
* Fully scrolling at 19.2 K baud
* Keyboard and RS232 data input

COMING SOON: Terminal emulations including TEK 4010 in monochrome and colour. Character displays 80 x 24 and A4 size

APPLE II is the Trade Mark of Apple Computers Inc.
Olivetti add-on

Olivetti isn't sure that it's all that important, but the M20, just as an aside, now runs standard operating software. That is: it runs CP/M-86 and MS-DOS on an add-on processor.

You had to be pretty keen-eyed to spot this. The announcement spent a paragraph talking about how the machine was 'oriented towards professional applications'.

Then it said it was 'suitable for use in many other applications'.

Then the text dwelled lavishly on the Zilog Z8001 processor, the disks, the screen, the graphics, and the keyboard.

Next, the fact that the screen could be adjusted took up a fair amount of print. Windows were mentioned.

After that, we were told that the M20 'is able to work with other computers as a terminal' and that, in turn, 'other peripherals could be attached to it'. These included, we were informed, printers.

Finally, on the bottom of the page, the announcement said that the M20's operating system, — PCOS, Professional Computer Operating System — is 'exclusive to Olivetti, and fully exploits the system's potential'.

There was another page. It began with a nice, fat paragraph on Basic 8000, assembler and Pascal languages. It mentioned all the OLI brand software.

And then just fleetingly, before passing on to the last paragraph which told of a possible local area network (Oh, no! Not another one! — Ed), there was the shy little announcement:

'In its bi-processor version, incorporating an Intel 8086 processor, the M-20 is also able to operate in the popular CP/M-86 and MS-DOS environments for which a host of application programs are available on the market.'

For the price of this add-on, I was referred by the press office on the stand to the sales staff. They suggested that I get the price list from the press office. I suggested that I had work to do, and left. I suppose they see their sensible move as some kind of admission of failure.

Bigger and better

PCW Show time is once again approaching fast. This year, of course, the Show's all set to be even bigger and better than last year.

The Barbican Centre, for the second year running, is to be the venue. Dates are 28 September — 2 October.

In the coming months, up until the time of the Show, we'll be issuing monthly updates on exhibitors and other bits and pieces of interest. Regular visitors will remember the chess feature of old and the Scrabble championship from last year. These will both appear again and the Scrabble contest will be larger to cater for more visitors.

More on Europe's biggest Microcomputing Show next month — watch this space!
Regular readers will be aware by now that I have a considerable suspicion of all video and computer games. I am also aware that such suspicion puts me into the minority.

I did, however, participate in a 'computer games' incident recently that intrigued me. To me it makes an interesting story, so I will bore you with it. After that, we can argue the toss about what it all means... you know, WHAT IT ALL MEANS...

Right, the story.

An acquaintance of mine popped round a couple of months ago to borrow a bottle of scotch or something. What he came for is now irrelevant, for while we sat chatting, he spotted it — a home computer sitting on my desk.

'Ere, wossat?' said my acquaintance (actually he doesn't talk a bit like that but it heightens the dramatic effect, don't you think?). 'That, my good man, is a home...'

'Are we opting out of the real world into an illusory one? Martin Banks continues his invective against those inviolable invaders from space.

MICRO MACHISMO

Now, my own thoughts and aspirations tend to side with the latter school of thought. I cannot help but feel that the personal computer in all its many potential guises (most of which would probably not be seen as a 'computer' at all) is like manna from heaven. Almost, as if there is a God somewhere that is saying 'OK, you guys have managed to cock up everything else I've tried, let's see what you can do with this gizmo; let's see if you can make this one work to your betterment.'

Even I accept that, in reality, this is a fond dream. I do not accept, however, that the carrots and aspirations that lie behind the dream should not be pursued; that all the goals are unattainable. That some are attainable can be seen now in music, where the 'computer' in the form of the synthesiser...

...so attitudes have changed about what is a good way to demonstrate one's machismo.

et al has opened up the possibility for individuals to display and develop their creativity without recourse to ten years or more of hard labour learning an instrument.

As a musician myself (and a poor one) I personally feel that coming to terms with an instrument is the best way, but I am not so much of a purist as to condemn those whose urge to create now demands that they take whatever route is available to circumvent the drudgery. That, to me, is an excellent use of the computer as a tool, a justifiable means to an end.

However, I cannot feel the same way about games. In fact, I feel that they achieve — maybe even deliberately achieve — the exact opposite.

Here comes the splendidly elitist point in the argument, for I cannot help but feel that the games programs help to push individuals down to some level of 'lowest common denominator' of intellectual activity or aspiration. It is elitist if only because, as was pointed out to me by an admittedly bitter teacher a couple of years ago, 'waffling on about what good the computer can do for individuals is rubbish. In reality the vast majority are ineducable.'

Bitterness is often an over-reaction to reality, but the essence of the reality exists... many people can probably be defined as ineducable; a lowest common denominator approach to dealing with them is probably sensible; the computer game is probably the best way of giving them something to do, something to 'be' in a way that is harmless.

The demonstration of a machismo in

battered ego, for my neighbour insisted that it was now my go: that we were in some way in competition. So I took my turn against the invading hordes and, like many a battle commander before me, got completely wiped out.

Now this prompted quite a significant reaction in my acquaintance. His spirits immediately perked up because I had failed to clear the screen even once. (I must admit here that up until this point I had not even realised it was possible to clear the screen and continue the game, so badly do I play it.) Ego was at once restored, machismo came forth, and by the time I cleared my score somehow elevated him to some point where he perceived himself as definably 'better' than me.

What made it all the more interesting to me was the fact that he was surprised, nay, almost horrified, that I didn't care about either the game or who won. The impression I gained was that I, in some strange way, was less of a... dare I say it... man than he for not being good at Space Invaders and, even worse, not being interested in being good at Space Invaders.

Now my acquaintance is a good bit younger than me; he must be to have been able to play Space Invaders at college, so attitudes have changed about what is a good way to demonstrate one's machismo. In my young day it was silly things like drinking competitions and riding round town seven-up in an MGB; all very conventional and middle-class.

The personal computer and the games program seem to be changing all this, for — silly as they might have been (and in practice, as harmless as they were) — those older pastimes were at least real. We actually participated in them, ran the risk of being sick from the car as it careered round a corner. With computer games it would appear that individuals are being removed from contact with reality. It becomes important to show that one is 'better' at unreality than someone else in order to prove that one exists and has a part to play in life.

So much has been written in the past by pundits, experts, genuine thinkers and the like about what the computer/micro-electronic/information technology revolution can offer dear old humanity (even I have made the odd mention of it in the past). Much has been made of how the bad aspects should be watched and controlled, or how the use of machines by unscrupulous individuals and governments could come to dominate the actions, even the thoughts of people. Much has also been made of how the computers can be used to advance knowledge, education and creativity to the point where a kind of Utopia could be made a practical reality.
being the best blitzer of screen images with other screen images is probably better than exercising it by beating up one's fellow human beings in the flesh.

I can't help feeling that it shouldn't be so, that even the games approach can be used to better advantage, and that the personal computer can add more to human endeavour than it seems to be taking away at present. If that sounds elitist and/or evangelical, so be it.

Otherwise, it is going to be a rotten world we will live in, though most of us will never see it. I'm not sure I will want to. All I'll want is to be locked in my little cell with some nutrient tablets, a computer with speech synthesis and recognition, and a program called Eliza. At least that way I'll get a decent conversation.
Microshell for Z80

The Unix operating system has many useful features, and I am beginning to regret having got an 8-bit, CP/M based system. Is there any way of running Unix on a Z80 machine?

G Dearden, Manchester

Unix, and the various Unix derived operating systems such as Xenix, are essentially 16-bit systems, and take up more memory than can readily be provided from the 64k directly addressable by an 8-bit CPU. However, it is possible to obtain some of the advantages of Unix while running under CP/M.

The Microshell program from New Generation Systems Inc. is distributed in the UK by Astro Information Systems — provides many of the more useful Unix features, particularly that of redirecting input and output. Thus it becomes easy, for example, to put the DIRECTORY listing to a file, so that it can be sorted or otherwise manipulated. In the same way, the output from a program in Mbasic can be sent to a printer, without having to change all the PRINT statements to LPRINT!

The TYP command in Microshell is similar to CP/M's TYPE, except that the display pauses every 23 lines until a key is pressed. Perhaps the strongest feature is the Unix style Shell, which allows commands to be read from a file in a more powerful and faster manner than SUBMIT and XSUB.

The last aspect of Microshell I will highlight is its ability to search for the required file under program control on all the active drives, rather than just on the logged-in drive.

P L McLimnoye

Commodore 64 clarification

I am the proud owner of a Commodore 64 and would like to ask a few questions about it: When will Simon's Basic be available and what does commands do it provide? Are Commodore planning mini disk drives for the 64? What users' clubs/magazines are there for owners? Will there be any manuals additional to the user guide supplied with the machine?

Christopher Tipper, Charthorpe, Surrey

At the time of writing, Simon's Basic was scheduled to be available on cartridge at the end of April. It includes commands to simplify operation of the video and sound facilities, eg, PLOT, LINE, CIRCLE, ENVELOPE, PLAY. There are extra maths commands: MOD, DIV, FRAC, binary to hex conversion. String handling is improved, with find substring position, and insert string within string facilities. Finally, some attempt has been made to introduce commands to enable structured programming in Basic, eg, IF...THEN...ELSE, REPEAT...UNTIL, LOOP...EXIT and procedures. There is much more, but this gives you an idea.

Commodore are not at present planning to bring out any mini disk drives for the 64. The cheapest Commodore mini disk drives available is the 1541. The 64 will support CBM/PET disk drives when the IEEE cartridge is made available.

The only UK user club is ICPUG, which as well as providing a national newsletter, software library and discounts, also supports regional group meetings throughout the UK. Contact the Membership Sec at 30 Brancaster Rd, Newbury Park, Ilford for details. There are no magazines dedicated solely to the 64 at present. Commodore are producing a Programmee's Reference Guide to the 64 which tells you all that the initial user guide doesn't! It is an excellent guide which indicates how the 64 facilities, such as high res plotting, and altering the use of RAM space. There is also a book, Commodore 64 Computing by Ian Sinclair, published by Granada at £12.50.

Brian Grainger, Independent Commodore PET Users' Group

First choice...

I am thinking of making the Acorn Electron my first computer, because I have some computer experience and I am very interested in computer graphics. Can you clear up a few points for me? Are the graphics on the Electron as good as on the Atom? Is it possible to program it to draw a 3-D object, to rotate the object and 'zoom' in or out? Could a 3-D map of, say, a valley, be drawn so one could 'fly' through it?

Christopher Tipper, Characterhouse, Surrey

The Electron is essentially a lower-cost entry to the BBC Micro, providing the computing and display facilities, but with the other built-in hardware features of the 64, such as high res plotting, and altering the use of RAM space. There is also a book, Commodore 64 Computing by Ian Sinclair, published by Granada at £12.50.

Brian Grainger, Independent Commodore PET Users' Group

Improvements for Atari

I own a Vic-20, and I am thinking of selling it to buy either an Atari 400 or 800. I was put off because the mathematical operations are slower than the Vic-20, and it can't handle string arrays of more than one dimension. Could this be improved in future if Atari develops a new Basic cartridge?

Fai Yuen Chan, Congleton, Cheshire

The speed of Atari Basic's mathematical operations is dependent on the floating point routines, which are stored in a ROM separate from the Basic cartridge. Newell Industries have produced a custom floating point ROM called 'Fastchip', which is a direct replacement for the original ROM. This cap gives up to 3½ times the speed of the Atari floating point routines.

This new ROM can be obtained from Silicon Chip, 302 High Street, Slough (0753) 70639, price £29.95.

String arrays can be implemented in Atari Basic by using substrings. They are a peculiarity of Microsoft Basic, and are not in the proposed ANSI Standard Basic, so don't worry too much about not having them. As far as I know, Atari hasn't any plans for developing a new Basic. However, Microsoft Basic is available on disk for the 64, and should be available on a cartridge later this year.

Terry Cleevely

Alternative keyboards for Atari

Is there an alternative keyboard available for the Atari 400? It has a flat membrane keyboard which I don't like. Any details would be greatly appreciated.

J Cole, Broadstairs, Kent

There are several full-stroke keyboards available for the Atari 400. One is the B-Key 400 from Inhome Software. This can be obtained from Silicon Chip, 302 High Street, Slough, for £79.95. It can be fitted in a matter of minutes. Another replacement keyboard comes from Blyby Video & Computer Games, Crossways House, Lutterworth Road, Blyby, Leicester (0533) 773641.

Terry Cleevely

Send your queries to Len Warner, 35 St Julian's Road, St Albans, Herts. Please note that Len cannot answer questions on an individual basis, so please don't send an SAE with your query.
COMPUTER ANSWERS

a small portion of the picture is being moved. High quality pictorial graphics can only be achieved using enormous computer power, or by photographing separate frames as stills and showing them as a movie, or both. Realistic surface shading needs very fine luminance and colour resolution. Yes again, but this requires considerable experience in graphics programming, and definitely lots of assembly language skill. If you wish to use the Beeb highest resolution (640x256), then you may run out of memory fairly rapidly unless you are using a second processor.

Sheridan Williams and Len Warner

Printers parameters

I also have a problem using the new DMP400 printer, which I would like to force to produce 80 columns instead of the normal 132. This is for program listings, so I cannot alter the program output.

T R Martin, FCA, Fulham

Your printer problem is also a fairly common one, so I will give a general answer to help as many readers as possible. There are two approaches; both depending on the printer having the necessary features. Read your printer handbook to see if either is supported.

One way is to set a switch selectable option to force an automatic new line after 80 columns. The switch is usually inside the printer, so changing back and forth is inconvenient.

The other method depends on your printer responding to various control codes sent to it before the text to be printed. Find the 'escape sequence' of codes which will set the line to 80 columns. Since the printer will keep this setting until you choose another, you can run a small Basic program to PRINT CHR$, the codes needed, before you print your 80 column file.

P L McElmoyle

More directory space

I have a problem with files on my TRS-80 Model 1 disk system, which has 2x40 track and 2x80 track drives running under NEWDOS 80 V2. I have a time sheet system which creates a file for each client on the 80 track drives. I have some 110 files on the disks, which now have zero FDES but about 108 grans left. Is it possible to reserve more directory space, as this would appear to be the problem?

T R Martin, FCA, Fulham

You are quite right; the trouble is due to having filled up the available directory space before running out of disk space. This is a common problem when using a lot of small files.

A similar problem occurs with CP/M systems, where I often run out of directory space on 8-inch double density disks well before reaching the maximum capacity of some 650 bytes.

It is not easy to solve this problem, as a specific track is reserved on each TRS-80 disk for the directory: this has a maximum capacity of 48 files on a 35 track disk, 55 on a 40 track and 110 files on an 80 track. While I believe it is possible to circumvent this by locating the directory elsewhere on the disk, the result is a very great slowing of disk access speed. This might just be acceptable for loading a program, but it would be out of the question for running a program which accesses files often.

You do not mention whether you are using sequential or random files in your application. A relatively simple solution is to use random files, with each file holding data for two or more clients. You would then use the FIELD function to split the file up into its separate parts, once it has been loaded from disk.

CP/M users have the advantage of being able to join and split files at operating system level using PIP.

P L McElmoyle

Young entrepreneur

I am 15 and write programs as a hobby, but I would like to sell them on cassette to earn a little money for add-ons. Where would I stand on VAT? How can I market my tapes, and can I use programs I have had published in magazines?

(Name and address withheld by request)

There are very many people already marketing programs they have written; you only have to look through the small ads in PCW to see. The competition is fierce and unless you have around £500 to invest in a larger ad to start such a venture you are unlikely to catch the eye of the mass of users. Don't let that put you off though. Test the ground first to assess demand. Start with a small ad in a magazine that specialises in your particular micro. Make sure that you can cope with a rush of, say, 100 orders in the first instance, and don't bank the money until you are ready to despatch. Keep clear and detailed accounts. You will not have to register for VAT, so no need to worry about that yet.

You normally keep the copyright to any material published unless you sign away that copyright, so you can earn £25-£50 per printed page for your program published in a magazine, and still be able to sell tapes of later versions.

Another possibility is using an existing software house, who will market your program and pay a royalty on each copy sold.

Finally, there is Micronet 800, the Prestel personal computer user group. Unfortunately, they ask for the copyright, but if your program is very good you can haggle — they may want it anyway.

Please make sure that your programs have been tested and debugged thoroughly — use several very critical friends, offer to give them £1 for every error or sensible criticism they find. If you are not willing to do that, then I suggest that you are not confident enough in your program to market it. Remember that people are entitled to their money back if it does not do what is claimed of it.

Sheridan Williams

Disk dilemma

Trouble with 'back-up' on my CBM 8032 has corrupted part of my primary disk. Some files shown in the directory give a 'file not found' error, preventing disk back-up. Could you give a routine to read the file names from the directory into an array, so that I can use it in a file copy program which skips the corrupted files on the primary disk.

A J Willis, Beaconsfield

People who are getting deeply involved with the PET/CBM micro should invest in Programming the PET/CBM by Raeto West, published by Level at £14.95 (or £15.90 post paid from Mol, St Albans S2801). Chapter six deals at length with disks, and on page 218 you will find a routine to read and print the disk directory, which I am sure you will be able to modify to store the directory contents instead.

Len Warner

Sooner or later, Clive, someone is going to find out.

PCW 115
Since late 1979, either 400,000, 250,000 or 200,000 (depending on the source) people have reached into their pockets, pulled out either $200, £150 or £125 (depending when and where they were buying) and walked away with a copy of the famous Visicalc program. Just to save you reaching for your spreadsheets, I can tell you, taking the most conservative figures, that adds up to a total value of sales around £25 million. Not bad going for a product written by two MIT graduates with a third floor apartment for an office.

Not bad going for a product written by two MIT graduates with a third floor apartment for an office. Since those early days, the two MIT graduates, Dan Bricklin and Bob Frankston, have grown into a company (Software Arts) of 50-plus employees, and Visicalc is now available on more than ten different machines, from PETs to IBM PCs. There are also a score of imitators — some have been covered already in this series — and a host of Visicalc add-ons and 'improvements' produced by independent manufacturers.

In this article we will look at a series of improvement products produced by a UK company named Vergecourt. Basically, a fairly high percentage of those 200,000-plus purchasers bought the Apple II version of Visicalc — this being the original version. Accordingly, Vergecourt's (spreadsheet) products are aimed solely at that considerable number of Visicalc users on Apple. And it has reputedly sold 'into four figures' of Visicalc enhancements in the 18 months since its first product was launched.

Its top of the range product, with the tautous title of 'Super Expander 80.2' provisionally provides you with the facility to create and manipulate very much larger spreadsheets than are possible with Visicalc alone. It also interfaces Visicalc to a selection of 80-column display cards and provides several additional command facilities: enhanced formatting, validation, fast data entry and so on.

Of course, if you want to use these facilities you can't just buy the software — you must also dip into your pockets for some relatively pricey hardware. You will need Vergecourt's Ramex 128k RAM card at £295, and optionally — you can stick with 40 columns if you want an 80-column card costing typically £150-£200. If you really want to build up a huge spreadsheet model you can also buy another 128k RAM card which would permit your spreadsheets to consume up to 25k — over ten times as much as can be handled by Visicalc without expansion RAM.

A roofrack for the Apple

Suppose you use a small van for general fetching and carrying but you find, occasionally, that it just is not big enough. A nice cheap option is to buy a roofrack. This would enable you to deal with the occasional extra load, without the expense of trade-ins and higher running costs. Of course, if you regularly and excessively overload then you will be heading for big trouble, since although the roofrack can stand the strain the small van undoubtedly cannot.

Well, of course, the sort of enhancement product being considered here is rather like the situation with the van and the roofrack. Yes, it can be extremely useful, enabling us to create very much larger spreadsheet models than was previously possible, but we are still stuck with the Apple II's processor speed and disk capacity, etc. If it takes, say, 30 seconds to calculate a 24k spreadsheet model, then it's going to be at least five minutes on an equivalent 250k model. If an Apple disk can hold only 130k of data then we need two whole disks to save one full 250k model.

So, the moral of all this is, spreadsheet memory expansion facilities, used intelligently, can be of great value: you don't need to trade in your existing machine. You don't need to retrain for some other package. You don't need to convert all your existing models, etc. If you do ever push these facilities right to the limit then, unlike the roofrack, it won't blow up your machine, but will just become progressively more sluggish and tedious.

Visicalc alone

Before looking seriously at Vergecourt's offering, let's consider what we can do with Visicalc alone. Visicalc owners can safely skip these sections.

The Visicalc package is supplied as a floppy disk, in a stout simulated leather ring-binder, containing nearly 200 pages of documentation, quick reference card and a few other odds and ends. The disk is specially prepared so that it cannot be copied by the standard disk-copying facilities, so if you want a backup copy (and I would advise everyone to have one), you must either send off the registration card with payment for one, or else buy one of the many advertised programs capable of copying Visicalc (and other similarly 'copy-protected' programs). Whichever way you obtain your backup copy, the copyright still applies with the possibility (if you should so much as lend it to your pal down the road) of, '...damages up to $50,000...up to one year's imprisonment... ?', to quote from the front of the manual. It's enough to scare you off buying it!

As I have already mentioned, Visicalc is available on a variety of machines, but here we are just considering the Apple II. With the Apple, all that's needed is a single floppy disk drive, but of course an extra drive and printer would be advisable for most users. With this set-up you can create spreadsheet models consuming up to 25k of RAM. If you add a 16k RAM card (available from many shops including Vergecourt — it costs £75), then without any modification or extra software utilities the 25k limit is extended to 34k. Why is there only a 9k increase from a 16k card? Well, there are various technical difficulties that prevent full usage of all RAM on the card.

Once you have Visicalc working with the 34k limit, then you have as good a spreadsheet system as is generally available today on any 8-bit micro. That is to say: if Visicalc was a brand new release today, I would still give it a good review. It surpasses many of its imitators, with no major signs of ageing.

In addition, a major advantage Visicalc holds over the other spreadsheet systems is the enormous variety of add-on facilities that have sprung up around it. Thus, if you want training you can go on a course or buy special training disks and documentation. If you are mathematically inept and have a fairly standard requirement, then there may be a 'template system' which will set up the Visicalc model for you, etc. Of course, the Vergecourt products are part of this list of add-ons.

Using Visicalc alone

The Apple version of Visicalc is a complete turnkey system. To get started, put the disk in the drive, switch on and you are fairly instantly treated to the world-famous display. Part of the screen is displayed in inverse characters (ie, white background); a status line at the top, followed by a
prompt line and then, skipping a blank line, we have the inverted 'L'-shape for the border of the spreadsheet itself. At switch-on the spread-sheet area is completely blank, except for the cursor at the top left-hand cell. On screen at any moment 20 lines of spreadsheet cells wide can be displayed. Of course, as the Apple screen is only 40 characters wide, that is all there is room for (until you upgrade with Vergecourt), but like most of its imitators, Visicalc permits cells widths to be changed. So if you are working with small numbers you can fit more cells in the width available, but you are still stuck with a maximum total of 40 characters across.

The Visicalc manual has two major sections: a tutorial arranged as four lessons and an extensive reference section. In my opinion, the manual is so good that I can't imagine how the Visicalc training vendors ever sell anything. The four lessons are designed to take you from complete novice through to fumbling expert after just a few hours' practice. The reference section should answer every last conceivable query you may have about the system and once you are fully conversant with it there is a handy reference card to act as an aide-memoire.

Actually, setting up formulae, entering text and numeric data is pretty much as I have previously described for its imitators. There is an excellent split-screen facility, so that two distant areas of spreadsheet can be simultaneously on display, and all disk operations are integrated as part of the system. Unlike many other software packages, particularly those written for CP/M systems, Visicalc allows you to initialise new disks, load, save and delete, leave the disk drive door open and everything else without getting involved with the Apple's operating system.

Of course, Visicalc has an extensive range of maths facilities including trig, logical, row-sum, not to mention 11-digit precision arithmetic. The only facility I am inclined to criticise is the printing. Every time you hit the print key you have to remember a cryptic sequence of characters to inform the printer stationery (and break reports into sections if they should attempt to print. Visicalc does not automatically provide a 'Please Wait' message.)

Entering Vergecourt!

My review material, kindly loaned by Vergecourt, comprised one 128k RAM board, and 'Enhancer' disk with documentation and a Super Expander 80 disk with documentation. As my copy deadline loomed, Vergecourt released a new Super Expander 80.2 software system containing all the features of '80' but with the ability to handle two, not one, 128k RAM cards, as well as super-fast disk saves and three new commands for the system itself. The Jenkins of Vergecourt rushed around to demonstrate its 'new baby' to enable me to report on it here. The evaluation work, however, was based on the version '80'. Just to clarify what I found to be a fairly confusing plethora of product names, here are the Vergecourt offerings relating to this article:

16k and 128k RAM cards. Visicalc itself can handle the 16k RAM card. With the 128k RAM card, additional Vergecourt software must be purchased for it to be of any use with Visicalc. (It does come with free Enhancer software facilities providing disk emulation and extra program space, both useful for the Apple applications programmer but irrelevant to Visicalc.)

Super Expander software. This simply enables Visicalc to use the 128k RAM card, increasing maximum spreadsheet size from 32k to 136k, i.e. by more than five times. Since the huge spreadsheet models can take up to two or three minutes to save on disk, Vergecourt has thoughtfully provided additional commands to do quick loads and saves — around 20 seconds or so.

Super Expander software. Everything in the above system plus ability to utilise a variety of 80-column cards, plus yet more disk facilities.

Super Expander 80.2 software. As above, but can handle two 128k RAM cards plus three new Visicalc commands (unrelated to storage space): validation facilities, extra formatting (e.g. negative numbers in parentheses, prefix currency characters), and an applications-turnkey facility.

One final thing. The products are also available for the latest version Apple Ile and work with most versions of Visicalc under the DOS 3.3 operating system.

Getting started

Having stumbled for a few seconds attempting to open the elegant packaging for the 128k RAM card, I had to reach for my sunglasses when I succeeded. Vergecourt has departed from the usual boring green printed circuit board and adopted a stunning ketchup red. Coupled with the dazzling gold labels signalling the usage of new generation technology, the overall effect is of a fairly striking piece of hardware. It's a pity that you can't see it when you are using it (and enough to tempt you to buy one of those transparent lids now manufactured — just a matter of switching off and plugging the card in a vacant slot. The most tricky part of the whole operation is fathomning out which slot can be used. After much manual scouring, I eventually determined that it was in my case anywhere and there would do.

Vergecourt software can automatically find the location of the card, so in most instances it does not matter where you put it as long as it's in the Apple somewhere!

To get Visicalc running and using the new card involves a 'two-stage boot'. Switch on with the Vergecourt's Expander 80 disk in place then, after a short while, replace it with your normal Visicalc disk. Before this disk can be read you must indicate which type of 80-column display card you are using. I found this a little puzzling in two ways. First the question is asked on a neatly-formatted display already using your 80-column card, if it can get this right before it asks the question, why ask at all?

Secondly, you have to type in a number, but it does not tell you on the screen which number is for which card, so you have to consult the manual. Anyway, as soon as you hit that number, the disk drive starts whirring and after a painless amount of time (too long) with a totally blank screen, the familiar Visicalc screen appears. (Vergecourt has pre-empted this criticism with the 80.2 — a 'Please Wait' message is shown.)

I said 'familiar', above, but of course there are a couple of major differences. The top right-hand corner displays the imaginary figure 136, indicating 136k of free memory for our spreadsheet models and, of course, we have twice as much on display because the system can now make full use of the 80-column card.

Eating (RAM) chips

Having got this far I was anxious to 'eat up' as much as possible of the 136k of available RAM. Although the hardware/software does have other facilities, I would identify this as being the major reason for using a Vergecourt system. Quickly keying in the main Benchmark test, I discovered that the 13-column test-model could be replicated right down to the last (254th) row and still leave a lot of memory to spare. This compares with 34k Visicalc (ie, normal Visicalc but with a 16k RAM card installed) which completely exhausts all storage after 82 rows. In fact, Vergecourt's enhancement provides both; nominally four times as much memory (4 x 34k = 136k) and also, in practice, four times the maximum model size.

Manual trouble

It goes without saying that there is very little for the expert Visicalcer to learn about this new system since the basic operation of Visicalc is unchanged and the Vergecourt software (except for the enhancements — see below). This is just as well, because the Vergecourt manuals are fairly heavy going.

I found their content muddled in places and some of the explanations a little confusing. Actually using the product is incredibly simple, but you wouldn't think so to look at
EXPANDING THE APPLE

the manual! Another source of annoyance stemmed from the fact that two manuals are provided (one for Visicalc users and one for everyone else). Both are identical on the outside with no title at all! I, of course, kept the manual! Another source of annoyance EXPANDING THE APPLE short manuals 'slip through the net'. etc, I felt surprised that it had let these fairly short manuals 'slip through the net'.

Visicalc enhancements

As I have already explained, Vergecourt provides a choice of software relating to Visicalc and the 128k RAM card. The principal facilities available relate to interfacing Visicalc to the 128k card and to a variety of 80-column cards, but there are also other facilities 'thrown in', appearing as extra command options in the Visicalc system itself.

Most pertinent to working with large spreadsheet models are problems with saving and loading to disk. It's all very well being able to create 136k spreadsheet models, but how do you get them onto slow and low-capacity Apple disks? Vergecourt has attempted to solve this one in two ways: a special fast 'binary-save' and the opportunity to save in two or more halves. Since saving in two halves involves using two disks, with the consequent risk of mispairing with other paired disks, Vergecourt suggests you save each half on both sides of one disk. This is risky, particularly with disks only rated as single-sided (ie, disks with the consequent risk of mispairing). Vergecourt also suggests you save each half on both sides of one disk and save, instead of Visicalc's excellence. Fortunately there is no great need to use them after the early stages, so this deficiency is not as serious as it could be.

Firstly, does the Vergecourt+Apple system compare with the newer 16-bit micros, eg, IBM and Sirius, expandable (if your wallet can stand it) up to 800k of RAM? Well, it works out a fair bit cheaper but it does stand to be slightly less convenient and, if used to the ultimate extreme, pushes Visicalc and the Apple to limits for which they were not designed. On the other hand, the newer 16-bit micros do have greater disk-capacity and a slight edge on processor speed, both advantageous when working with large spreadsheets, but they are also more expensive.

In conclusion

If you are already using Apple Visicalc, and are frustrated by the 34k maximum model size, then the Vergecourt hardware+software solution has a lot to offer. If you also happen to have 80-column display facilities, then the opportunity to make use of them with Visicalc is also very attractive. However, you should not expect to fill up all this extra memory without degradation in performance: recalculation times are roughly proportional to the size of the model and loading and saving onto the limited Apple disks will not be as straightforward as previously.

Vergecourt's latest software release will permit even larger, 255k, spreadsheets on the Apple, but attempting any serious work on the Apple with spreadsheets of this size would exhaust my tolerance for one. According to Vergecourt, it does have satisfied customers in this department, so maybe I am just not as tolerant as some! Also packaged in with this release are some novel facilities — which will undoubtedly be of interest to anyone wishing to create spreadsheet systems for naive users in an applications environment. There is no need to be put off by the 255k tag, since it's all there with 136k as well.

My only real grouse about the products is the standard of the manuals, which fall far short of Visicalc's excellence. Fortunately there is no great need to use them after the early stages, so this deficiency is not as serious as it could be.

Finally, how does the Vergecourt+Apple system compare with the newer 16-bit micros, eg, IBM and Sirius, expandable (if your wallet can stand it) up to 800k of RAM? Well, it works out a fair bit cheaper but it does stand to be slightly less convenient and, if used to the ultimate extreme, pushes Visicalc and the Apple to limits for which they were not designed. On the other hand, the newer 16-bit micros do have greater disk-capacity and a slight edge on processor speed, both advantageous when working with large spreadsheets, but they are also more expensive.

END
A two-minute operation turns your BBC Micro into the heart of a word processor.

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Or, for details of your local Acornsoft dealer, phone 01-200 0200.
Maggie Burton finds out whether this is the Genie we’ve all been wishing for.

Nobody seems to know much about EACA International Ltd, except that it is in Hong Kong. Before the entry, some years ago now, of the Genie I into the micro market, the company was almost unknown.

The Genie III, launched in summer last year, is a large 64k business box with two disk drives. The Genie I and its brother (sister if you’re a feminist), the Genie II, are both TRS-80 compatible. Programs are written for TRS-80 model III and/or Video Genie all the time – rarely explicitly for one or the other. So you might logically expect the Colour Genie to be TRS-80 colour compatible. Well, we’ll explode that possible misconception first of all.

It’s a very different machine indeed, in spite of some inevitable similarities.

The Colour Genie (note the English spelling – this is used all the way through the manual, pleasantly enough) was announced late last summer. Delays followed (they are mandatory, it seems, if you are to produce a home computer at all). The machine was made available to dealers late in November 1982 under the auspices of Lowe Electronics, the sole distributor for this country.

The machine is available throughout the world, except the USA. Perhaps that would account for the use of English English (inasmuch as the Chinese produce English documentation) rather than American in the manual.

Lowe itself is a company with a comparatively long history. Amateur radio equipment is another of its specialities; micros being a relatively new venture. An attempt to secure distribution for the VIC-20 failed because Lowe wanted the sole distributorship and would settle for nothing less. Instead, it took on the Colour Genie.

The initial impression of this beast is one of a machine which was built to withstand a lot of knocking around. Should robustness rate highly on your list of points to consider when buying a machine, the Genie will almost certainly rise in your estimation.

The Genie (or EG2000 to give it another name) is cream in colour with a coffee coloured band running across it to distinguish the keyboard (I sound like a furniture designer now). It’s thickset and rather angular to look at.

It’s very heavy – about eight pounds – simply because the PSU is internal. The machine is, incidentally, unearthed (like many of its competitors). The TV lead is also fixed. This is sensible in a home machine. It makes it quicker to set up and put away and there are no leads (apart from the cassette) to get lost. To overcome the resultant heat problem, the PSU itself is surrounded by a huge heat-sink and the bottom of the machine consists more of ventilation slots than plastic. What looked (from the outside) like an internal speaker at first glance actually turned out to be no more than a round ventilation hole at the back on the right, behind the keyboard. The Genie outputs sound through the TV loudspeaker or another amplifier and speakers. In spite of all the holes, the machine still gets pretty warm after an hour or so.

It’s also very big (as compared to other home machines), as its dimensions will show. It’s 43.2cm wide, 28cm from front to back, and 8.4cm high at the highest point (the back). The casing is cuboidal although the height tapers a little towards the front.

Looking at the back, from left to right are the cassette port, expansion bus (into which ROM cartridges can plug), TV lead, audio (hi fi) output, video (RGB...
monitor) port, power switch (which is a rocker switch and made harder to turn off than on) and mains lead. Looking from the front again on the right side are, from front to back, a parallel expansion (for joystick controller or centronics printer), light pen port and serial port (a DIN socket) for modems and serial printers.

The 63 key keyboard is pretty conventional in its layout. Lower case (using the shift key a la MZ-80K) and 64 of the 128 graphics characters are directly obtainable through it. It also provides four function keys preprogrammed with some oft-used Basic commands. Shifting these keys provides four more possibilities. The Genie thinks it has eight function keys. These are to be found on the right of the main keyboard. To the left of the main keyboard is a little light which happily glows away when the power is on. Next to the space bar is a key labelled 'MOD SEL'. This toggles you between alphanumeric and graphics. How annoying to hit it by accident and find yourself suddenly typing gibberish! Two shift keys are situated one on either side of the 'Z' row, the left one with a shift lock on its outside. This is a 'hard' lock which makes a sweet little click when you press it. Very pleasant to fiddle about with while puzzling over huge calculations.

Then, apart from the control key, you have four arrows. These seem logical to look at but they're not. The left arrow is a destructive backspace (ie, back/delete), the right arrow jumps from one TAB position to the next, the up arrow is the exponentiation key and produces a '^[ when pressed and the down arrow is a carriage return/line feed. A repeat key on the outside left negates the need for auto repeat, so auto repeat is omitted. This key interestingly repeats the last key pressed until it is released. Therefore, you don't need to hold down two keys to type 'cont'. Finally, the 'clear' key clears the screen and homes the cursor.

All the keys are large and 'heavy'. Like VIC-20 keys they have the appropriate graphics characters silk-screened on their fronts. Typing extracts some noisy clattering and faint spring sounds. All the keys except the space bar have a pleasant 'gooey feeling' - when you press one it feels a bit like prodding a warm blancmange. Nevertheless, the keys respond to a fairly light touch and bounce back with a healthy bite. I liked touch typing on it - in spite of my recurrent thoughts of milk and-gelantine desserts. The space bar, though, should be on a different keyboard. It's dead and clattery. On one of the two machines I tried out, it often stuck and sometimes didn't work until pressed more than once.

Moving on, the machine is opened by undoing three screws in little wells underneath at the front. These screws are even provided with little washers which I've never seen before on screws for a home micro. Once these are undone and put somewhere where they won't get eaten by the dog, you can lift the top from the machine, unplug the keyboard connector from its socket at the back of the machine and look at the whole PCB. Putting the damned thing back together isn't half as easy - you have to position the top of the casing just right so it snaps shut when you put it down.

At first sight the PCB is logically designed, but there's something just a little bit wrong. Basically, it could have been fitted into half the space it actually occupies. At the same time it reflects the solidity of the whole machine. A small separate board containing the interpreter EPROMs and two spare sockets is fastened to the main board by way of two little metal columns. Bunches of wires are clipped - not taped - together and all loose single wires are securely fastened to the PCB out of harm's way. All the ports which, on many other machines, give you a big hole through which to look inside the machine are provided with little plastic hoods to hide the circuitry.

With the front of the machine facing
you the components are mostly towards the back of the PCB; the front under the keyboard being occupied by an expanse of odd little gates. On the right next to the PSU is a strange little board held on one end by two plastic clips. Without taking delicate things to bits it is impossible to read the names on the chips to see what they do here. Next to this is the UHF modulator with the computer end of the TV lead firmly soldered to it (a laudable measure, as before said). To the immediate right of that is the standard 16k of RAM (all in the same part of the board) with two banks of pins at either end to facilitate the inclusion of a further 16k on a little extra board. The keyboard cable connects just behind this. Then in front of the RAM is the character generator chip and on its right are the EPROMs with the Z80 in front of them. The sound chip (AY3-8910) is on the right of the EPROMs and the CRT controller chip mysteriously turns up miles away from anything on the right towards the front.

In front of the PSU is a transistor which is surrounded by a large aluminium heat sink. Don't ask what that does - I have no idea, but the heat sink looks like it means business.

Using the system

On power-up the machine asks you the enigmatic question 'MEM SIZE?' (hardly user-friendly). Default response is to press return, which affords the slightly more comprehensible 'COLOUR BASIC READY' and a square cursor which flashes at a noticeably uneven and rather too rapid rate. (The cursor is programmable by POKEing two addresses with one each of several values. You can thus alter the flash rate and cursor size.)

Should you specify a number instead of pressing return, you then reserve an area of memory for whatever reason you may wish to reserve it. This number should be the highest memory location available for use by Basic—in decimal.

My programming ventures with the Genie began with some confusion. While the manual clearly stated that the machine has eight colours, other sources insisted the number is in fact 16. Even in the present manual (errors of this type are forgivable in a draft copy), it is maintained that the machine has eight colours. The truth is between the two. To get the full benefit of the Genie's colour capability you need to have the thing tuned in just right; it drifts off often and the AFC control will usually hold it. Otherwise the colours simply become shades of off-white. They're rather pastel anyway. The colours 9-16 are tones, not colours. To me they looked little different from the first eight colours but a difference can be seen if the TV is functioning correctly. Colour
Once inside the impression is one of spaciousness and solidity is controlled by the COLOUR command. At the same time, you are told in the manual that using the control key with one of the first eight colour numbers will change the subsequent display to that colour. On both the machines I tried, this function did not work consistently. The background colour is green. Colours range from white through orange and a slightly puce pink (red) to bluish hues and finally an almost invisible slate grey. These are text colours. The background colour is any colour you like as long as it's black (except in high resolution graphics where changes are possible).

This seems as good a time as any to mention the fact that some TVs are not only dodgy with this machine but utterly incompatible. One of these was my Hitachi portable. On this television it was impossible to fix the high resolution graphics display, although the low resolution one was fine. Other TVs which produce bad displays are, according to a Genie dealer, Pye and Philips. ITT, Grundig and Sony Trinitron all work well with the machine although they need very careful tuning. One machine I tried out worked perfectly well for a day or so and then began producing huge amounts of snow on the screen at regular intervals accompanied by a short, hissing crackle. Tuning did not help, nor did turning the machine off for a couple of hours. Something in the circuitry was interfering with the video control.

**Microsoft Basic**

The Colour Genie uses Microsoft Basic. That means one has to suffer the almost insufferable - the Microsoft editor. So while looking mournfully at little arrow keys I patiently tried it out to see if it was, after all, quicker to use than the cursor-key method.

Frankly, after a few complicated editing tasks I gave up altogether. Having to remember what 12 different keys do, and the formats by which one asks them to perform their often unnecessary functions, is too much. I retyped lines instead of editing them after that. It's far quicker. Microsoft Basic is not, by today's standards, a structured or even very powerful language. Inasmuch as Basic is itself powerful, so Microsoft Basic has power. But it's old fashioned. You don't see such things as PROC or DO LOOPS, which make programming easier and more readable. The Colour Genie leaves out DEF FN as well, which is a disadvantage. Making whoopee with graphics and colour is also, is some respects, difficult as compared to other home machines. You have no flash facility and no inverse video (unless you want to program the whole character set to be black and then it will only appear in squares rather than the whole screen). You can't change the background - no luminance, no double height or super/subscripted characters. Everything you want to do with this machine has to be done from scratch. To the more experienced user, it's a challenge. To the beginner, it's a maze which could be permanently offputting.

All the conventional areas in the Basic language are provided for in a Microsoft standard way. Arrays, strings (LEFTS, RIGHTS, ASC, VAL, STRS ...), functions (SIN, CON, TAN, INT, RND ...), loops (GOTO, GOSUB, FOR ... NEXT (with STEP as well) ... ) and conditions with IF ... THEN and AND/OR all pass the critical eye with little to report. The Genie, though, has some funny little idiosyncrasies which merit description. If you have your wits about you when writing a program it is useful to be able instantly to classify variables before you start. DEFSTR, DEFIN, DEFDBL and DEFSNG allow you to do that. By typing in one of these commands and either a letter or range of letters, you can make all the variable names beginning with one of the specified letters strings, integers (this is a bit like a more comprehensive INT), double or single precision. There is no way of marking up code or keeping a note on paper, of telling which variables defined under these commands do what. DEFSUB B, for example, does not give 'B' variables a dollar extension to say they are strings. While this is handy, it seems no more than a rather cosmetic measure.

Cassette handling is fairly good. Loading, though sensitive, is reliable. Using the Genie's own dedicated recorder adds to this reliability. Saving is a different story. I tried unsuccessfully to save a program on a couple of occasions, only to find, by using the VERIFY command, that it wasn't on the tape. The command SYSTEM puts you into the monitor for the writing and loading of machine code. The monitor is very poorly explained in the manual. Incidentally, the cassette lead has a blue remote lead attached. Nowhere in the manual is the use of this explained, and one machine I looked at had this lead cut off. Considering both machines were sent to me as packed for sale to a customer, this is rather odd. The machine with the blue lead still attached was the earlier one, so the deduction here is that the remote lead is no longer in use on later Genies.

The well-used ON ERROR GOTO phrase is oddly complimented by the addition of ERROR. ERROR followed by the specified error code (there are 22, each producing its own mnemonic when it crops up) will actually produce a reaction from the computer as if that error had occurred. That is, if you haven't had enough of errors already, you can make your machine bomb out whenever you feel like it. Perhaps in some applications
Vizawrite 64 is a high performance, low-cost word processor designed especially for the Commodore 64 computer. Vizawrite 64 takes full advantage of the colour, graphics and memory capabilities of the computer to bring you the power and style of a dedicated word processor. Serious word processor users expect their word processor to format their text as they type, Vizawrite 64 does this instantly. Tabs, indentation, centering are all clearly visible and easily altered, so you know exactly the format of your text all the time.

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programs it’s helpful to be able to control the generation of error messages, but the use of ERROR on its own will not prevent the machine from crashing – quite the reverse, in fact.

**Function keys**

The function keys I mentioned earlier are great fun. FKEY1 = "PRINT @" makes the key display PRINT @ whenever it is pressed. It’s also possible to add a carriage return to things like RUN just by omitting the second set of quotes. You can make the keys display words and numbers as well as keywords. It is not possible, though, to include a program ‘phrase’ like PRINT “HELLO”. These simply return a syntax error.

The arithmetic functions provided, as before said, are what one would expect on a Basic machine – with the exclusion of DEF FN. The Genie, though, also provides two INT commands - CINT and INT. Both of these do exactly the same thing – return the largest integer contained within an argument. CDBL and CDINT are single precision versions of an argument and FIX knocks off all the digits after the decimal point (isn’t that what INT and CINT do?).

The Genie also omits a PI function.

**Graphics and colour**

The graphics, as I said before, are not easy and are initially confusing to use. The Genie has two screens in video RAM at any one time. There’s the LGR page and the FGR page. These mnemonics are also Basic commands to switch you from one to the other from within a program.

In direct mode you can toggle between the two using control and ‘MOD SEL’ together to go from low to high, and the reset keys to go back again. Commands can be executed on the FGR page without being displayed. The FGR command is necessary to change the display from high to low resolution.

The LGR page is the one with ‘16’ colours, user defined characters, PRINT @ and the like. The FGR page provides PLOT, PAINT, SHAPE, BGRD and four colour (including black) with which to draw. The resolution is 160x96.

Drawing shapes is quite simple on this page. The CIRCLE command (with centre point and radius length specified) will draw a circle of any size on the screen. PAINT will fill a closed shape in the specified colour until it reaches a border of specified colour. You have to be a little bit careful when using this because if the virtual cursor meets a gap in the edge of the shape it is painting, it will ‘bleed’ through it and try to fill the whole screen. CPA56R allows you to load the colour of any point on the screen.

FILL, BGRD and NBGRD all change the background colour. The low res page does not allow this. BGRD will change the background to a bright pink. It is returned to black by typing NBGRD.

FILL will colour the screen with any one of the four high resolution graphics colours – green, blue, orange or black. PLOT … TO and NPLLOT are quite a powerful and easily memorable combination of line drawing commands. PLOT and PLOT … TO put points or draw lines on the screen. XSHAPE draws 'themselves' together to go from low to high, and the reverse, in fact.

Some quite complicated shapes can be drawn on the FGR page using those commands and shape tables. I must confess to a certain ignorance of the power of these things – entirely because they are never explained properly in manuals. The basic principle is simple although the practice involves knowing which addresses to poke with what numbers. While the rationale is plain, such terms as ‘upper nibble’ are not explained – yes, I know that’s half a byte – but what about someone who’s never touched a computer before?

Anyway, once you’ve POKEd your numbers into your shape table (the numbers tell the machine what direction it must plot in, and in what colour), you can translate them into screen data using SHAPE x y, which will, all being well, put the shape you want to draw in the right place on the screen. If SHAPE blanks out the shape – these two commands used together can create some nice effects of things appearing and disappearing with no trouble. XSHAPE changes the colour of a shape to its opposite – ie, blue will change to red and green to pink. SCALE is used to alter the size of a shape. SCALE1 is normal size. SCALE2 is twice as big, and so on.

On the LGR page the construction of complex shapes is somewhat easier than fiddling about with shape tables. User defined graphics can be produced, and these work by enabling the user to redefine characters 128-255 which are normally preprogrammed graphics accessed by using PRINT CHR$.

Here’s where it’s very easy to get confused. The Genie has four character sets – which are all mostly rearrangements of the default one. These consist of four types: alpha – normal alphanumerics; progs – programmable graphics characters, spec – the alternate set to be found on the keyboard and graph – a group of graphics characters used, according to the manual, ‘in non-English alphabets’. CHAR is a system command which allows you to switch from one set to another. CHAR1 leaves you with 128 graphics characters to program. CHAR4 gives you none because it’s all composed of alpha, graph and spec characters. It’s quite fun to print out the whole character set, type in different CHAR commands and watch the effects. PRINT all of the spec characters together is the best for user defined graphics – if you want to define more than 64 characters.

The Genie provides no BIN command. An ASCII code is assigned to a character using CHR$(they are also printed out this way). The manual kindly includes a program to make the rather complicated task of defining a character a little easier. Basically it involves binary and octal to decimal conversions and simpler methods have been devised. The default setting for this is a standard 8x8. When you consider that there are 960 character squares (40x24) on the low res screen it becomes apparent that very fine shape definition is possible.

The PRINT @ command is, incidentally, rather unusual. Instead of the usual PRINT c (which is actually more expensive than the acceptance of an individual number from 0 to 959 for a character position. This is quite simple to work out but confusing compared to the co-ordinates system. 0 is the top left corner, 39 is the top left, 80 is immediately below that, 120 immediately below 8, and so on. This ended posing a bit of a disadvantage, as I shall outline later. PRINT TAB and PRINT USING are also available.

**Sound generation**

The programmable sound generator AY38910 is in use in quite a few computers and sound boxes these days. The Genie controls it with two Basic commands, SOUND and PLAY. PLAY is the musical one. The parameters are channel number (there are three channels), octave (there are eight), note (from one to 12) and amplitude (from one to 15). Using this command you can make some interesting sound effects as two Basic commands, SOUND and PLAY. The chip has 16 registers and SOUND sends values to different registers depending on the sound wanted. It is possible to generate sound envelopes using this command. Gunshots, lasers, explosions and electric piano notes can be produced quite easily with this chip. Since sound commands come from the TV loudspeaker instead of a little cheap one inside the computer, the quality is pretty high.

**Add-ons**

The expansion capabilities of the Genie are fair. Disk drives will be launched soon, probably with a ‘GenieDOS’ rather than something like CP/M. A space is already reserved in memory for disk I/O. Two printers are currently available for the machine – the EG3085 which is the same machine as the new Apple printer, but £60 cheaper, and the EG603, which is substantially cheaper than the 3085 (which is actually more expensive than the Genie itself …). Both are dot matrix; the 3085 printing at 120cps and the 603 at 80cps. You have to buy a cable (at £39.50) to run either printer from the Genie, and this enables you to run any Centronics compatible printer. A light pen will be
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available sooner or later, but the demand for them does not seem too high at present. It could be some time.

The joystick controller is a lot of fun. It connects via the Centronics port which is, incidentally, not a standard connector but a row of those frighteningly fragile pins which might or might not snap depending on how careful you are. It is a fiddly thing to plug in and can come loose quite easily, much to my annoyance when I became frenetic over a space game. The cable connecting it to the computer is a little too short as well. Like the Genie, it is robust and solid. The two joysticks connect to the main console through coiled telephone-type cables. They can be clipped into it for extra stability.

The joystick comes with 12-key numeric keypads which have Spectrumsque rubber keys. The sticks themselves are metal with a hard round rubber gear-knob type thing on the top. Responsiveness is superb and movement is extremely smooth and easy. It was a joy (!) to play games using them, although they are perhaps a little pricey at £49.49. My big criticism of them is that they are not compatible with the Genie's PRINT@ function. Joystick position is read using four system variables - JOY1X, JOY1Y, JOY2X and JOY2Y. JOY2Y, for instance, contains the y co-ordinate of the second joystick. To find out the joystick cursor position for either joystick you need to know x and y co-ordinates. This makes it impossible to put both joystick co-ordinates into variables and then use these variables to print something at that position on the screen because, as you know, the Genie gives each screen point an individual position. Compatibility between these two functions would make joystick use a lot easier. KEYPAD1 or @ returns the value of whatever key on the keypad is being pressed.

The Genie is not, as it stands, expandable much out of its class. Spare sockets are provided for new ROMs which could lead to some interesting possibilities in future but no RAM expansion is available beyond 32K. No 80 column option is available, either, which makes word processing a bit of a problem. It is possible that one or both of these may appear in future.

Software

Software seems to range from absolutely terrible to excellent. Algray and Molimerx have always been names which spring to mind when TRS-80/Video Genie software is mentioned. Algray's programs for the colour Genie are, from what I've seen, rather spectacular, if poorly debugged, machine code offerings. Skramble is one I'd definitely recommend. Molimerx's games, if the one I tried out is anything to go by, are not so good - although judging by the company's past record the rest may be better.

The Genie's software library is quite big. It includes games, like the ones I've already mentioned, adventures, programming tools (eg, monitors, etc) and utilities such as file handling. In addition the Colour Genie User Group will shortly be providing a regular (probably monthly) magazine for its members. At the time of writing, Chewing Gum issue one was just about to go to press and includes news, programs and tips and a spot on software - including complaints about the ones to avoid. The user group is in the process of building up a big software library. Lowe Soft, Lowe's inhouse software distributor, will be commissioning and distributing software - some of it for educational purposes.

Benchmark timings

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All timings are in seconds. For a full explanation of Benchmark timings see PCW November 1982.

Technical Specifications

- CPU: Z80
- RAM: 16k (expandable internally to 32k)
- ROM: 16k
- Display: UHF TV 40x24. High resolution graphics 160x96. RGB monitor option.
- I/O ports: Cassette, serial, parallel, audio, light pen, ROM cartridge, expansion bus.
- Expansion: Disks/light pen coming. Printer available. ROM cartridges also available.

Documentation

The manuals for this machine are, frankly, awful. Machines which have been in the shops since before Christmas (yes, there are a few) will be supplied with the most incomprehensible draft manual you can imagine. A proper manual is now available but this is also pretty unhelpful. Neither pretend to teach you how to program (it's just as well) but they do both claim to be sources of reference. Nor do either of them fulfil that purpose properly. Not all keywords are explained; only the graphics ASCII codes are listed in the new manual (not the alphanumerics); there is no contents page and no proper, itemised index of Basic commands. The English is also a bit difficult to understand at times. This is almost certainly due to the fact that EACA probably wrote the original in Chinese and translated it directly into English. The grammar is, at times, quite amusing. Nevertheless, the new manual does provide some useful little programs and what it does explain is quite clear once you've read it over a couple of times. A technical manual is on its way which will provide much more information for the programmer who really means business. Regrettably, I was unable to get my hands on one.

Prices

16k Colour Genie £199
RAM expansion £38.50
EG3085 printer £410.55
EG501 printer £270.25
Printer cable £39.50
Disk drives N/A
Light pen N/A
(All prices include VAT)

Conclusions

To summarise, I'm puzzled. The extraordinary attention paid to hardware detail in this machine is tempered by some serious doubts and disadvantages. One of a few dealers with whom I spoke about the machine explained that he would no longer be stocking the machine until he was satisfied of its reliability. He claimed to have sent about 75 per cent of machines back to Lowe. This person may be very rusty, in which case he'd have problems finding any home machine which met his standards. He may also be right. Neither machine I tested exhibited any crippling fault apart from that of screen interference as mentioned earlier in the Bench-test.

All the same, the Genie is a machine with a lot of potential in the hands of an expert. For a beginner, its value as a purchase depends heavily on two things: software and documentation. I can't stress this enough. A book is planned for the Genie from Ian Sinclair - Mastering the Colour Genie. This should go to press very soon (if it hasn't by the time you read this). The software library should expand and the user group with its well thought out magazine will certainly provide support. Lowe itself is able to provide rapid and reliable maintenance where needed.

Lowe is aiming this machine at the games plus' buyer - ie, the knowledgeable enthusiast - and this is where it will go. I can't see it being a machine which will be a first time buy, mostly because it is quite complicated to use. It's a more subtle creature than the zapping, blasting, brightly coloured boxes of tricks people want to buy these days but, judging by the software I've seen on it, great things are possible.
This month's Screenplay sets a precedent by looking at games for two different computers, both of which have appeared in the shops in the last few months.

A major problem with any new machine is the dearth of available software. The Jupiter Ace has been around since before Christmas and it is only recently that the first few games cassettes have appeared. In the case of the Oric, response has been a bit quicker, and no doubt in the months to come software support for this machine will reach the VIC or Spectrum level.

The other indication that these are new models is the somewhat simplistic nature of the early games. This is similar to the situation soon after the Spectrum's arrival when software companies hastily revamped their ZX81 material to cash in on the new market.

The Ace, or course, is the first home computer to feature Forth instead of Basic and, as such, one would expect it to be the ideal machine for playing arcade-style games. In fact, the limitations of the keyboard tend to negate any gain in speed achieved by the use of Forth — indeed, I found using the Ace uncannily reminiscent of those long tussles with the ZX81, even down to the loading difficulties experienced with some cassettes.

The Oric-I has met with its fair share of brickbats, but this is more to do with the hurried way it was launched in unfinished form rather than any intrinsic faults in the computer itself. The Oric I used for this Screenplay was one of the early review models — as yet I have been unable to get my hands on a version containing final ROM chips, so I cannot say whether any derogatory comments I have made here will apply to the final production models.

---

**ORIC MULTIGAMES**

**Supplier:** Tansoft  
**Price:** £7.95 (16/48k Oric)

The first thing I noticed on trying to load this cassette was the fact that the label information is wrong — although one side of the tape is marked 'F' for 'fast', you need to append 'S' to the program name in the CLOAD instruction. Once I realised this, the tape loaded with no problems.

Multigames is a fairly standard compilation of simple computer games; they are all the sort of programs beginners are encouraged to type in for themselves as a means of learning about programming. 'Fruit Machine' is the first game on the tape, and is exactly what you'd expect — a very simple one-armed bandit. The graphics are somewhat on the small side, but are easily discernible, and there is a primitive HOLD feature which unfortunately allows you to hold only one reel at a time — so if you've got two matching symbols you can't hold them in the hope of getting three of a kind. You start off with £100 and each spin of the reel costs you a quid. The machine seems to 'pay out' as rarely as the real thing. I can't see much point in fruit machine simulations on micros — the only thing that makes the real thing fun is the chance of winning some cash; take away the money element and you're not left with very much.

'Projectiles' is 'Duckshoot' in disguise — instead of lobbing your artillery shell over a moon and down on the unsuspecting waterfowl, you have to shoot over a mountain range in the middle of an island. You have one gun, the computer has another and you take turns in feeding the small side, but are easily discernible, and there is a primitive HOLD feature which unfortunately allows you to hold only one reel at a time — so if you've got two matching symbols you can't hold them in the hope of getting three of a kind. You start off with £100 and each spin of the reel costs you a quid. The machine seems to 'pay out' as rarely as the real thing. I can't see much point in fruit machine simulations on micros — the only thing that makes the real thing fun is the chance of winning some cash; take away the money element and you're not left with very much.

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to use 'Slow' when you first load a game, then enable you to make your own 'Fast' copies.

Anyway, back to the Dungeons...

First of all, the instructions load and stay on screen as the game proper is loading. This scenario is as follows — the Evil Elves of El Galador raided the castle of Zorroth the Mystic, in search of the Rod of Power. Zorroth fled into the castle dungeons, where he was cornered by the Elves. To escape, he uttered a spell and promptly disappeared. Thus, the Rod of Power is missing, and your task is to find it...

At the start of the game you are given a random set of attributes, covering side. The same difficulties in loading were experienced as with Dungeons, but after changing some program lines I eventually got it up and running.

The aim of the game is to make a killing on the stock market. You start with £5000 and have the option of buying or selling shares in a range of companies like Ewing Oil, Yoric Micros, Synclair Toys, Borg Sports, ASL Software and Mothercare.

I started off by sinking all my cash into Yoric and ASL — and 'sinking' is the right word; company share prices in these companies promptly plummeted. I then spread what was left of my funds around a bit more evenly, and gradually began to recoup my losses.

For each turn you have the option of buying, selling or leaving things as they are; shares held, market fluctuation and cash in hand are all updated automatically. Every so often you will get a bonus in the shape of interest or dividends.

One thing that began to annoy me was the fact that fluctuation in share prices seemed to be much too random — it was very hard to discern any market trends. I enjoyed playing 'Stock Exchange' but it didn’t hold my attention for too long. It’s the sort of game that is fun to play once or twice, but I can’t see it proving addictive. Any number from one to four can play.

FLIGHT
Supplier: Tansoft
Price: £7.95 (16/48k Oric)

This is a very simplified flight simulation for the Oric-1 — but it’s so simple it hardly merits the name ‘simulation’; it’s more a game than a program to help you understand the controls of an aircraft.

This time there were no loading problems: using the CLOAD "name" .S format may take a long time but it sure is reliable.

The program starts with the Oric playing 'Those Magnificent Men in Their Flying Machines' and a series of on-screen warnings telling you to extinguish your cigarette and fasten your seatbelt. You take control of the aircraft while it is in mid-flight and your only task is to get it down on the runway in one piece.

Your controls are as follows: 1 turns your craft in an anticlockwise direction; 2 keeps you moving straight ahead; 3 turns clockwise; left cursor decreases thrust; right cursor increases thrust; up cursor pulls the plane’s nose up; down cursor sends you into a dive.

Your position, speed and thrust are shown digitally and are updated every second. To land successfully you have to come in at a speed of less than 90 mph, at a gentle angle and at an alignment of 90 or 270 degrees (due east or west along the runway).

You are shown a simple diagrammatic representation of the surrounding countryside, the runway and a radio beacon, and the Oric gives a fair rendition of the aircraft engine noise, which increases in pitch as thrust is applied. Unfortunately, on my Oric at least, the sound totally destroys the picture, making it judder alarmingly and playing havoc with the concentration. I found this extremely irritating and it caused me to abandon the game sooner than I probably would have done if the display remained steady.

However, even making allowances for this, I don’t think Flight would have held my attention for too long. In comparison to Psion’s excellent flight simulation for the Spectrum, this is sadly lacking in features. I must admit that I failed to make a successful landing — generally I lost patience with the display and deliberately flew into the ground at a high rate of knots while the Oric recited 'I don’t think this plane is well' or 'How good is the autopilot?'

One nice touch is the replay facility. This allows you, after you’ve crashed, to follow your doomed craft’s tragic dive into the ground. As the plane crashes, you see the pilot floating down underneath his parachute while the Oric plays ‘Colonel Bogey’.

STOCK EXCHANGE
Supplier: ASL Software
Price: £4.50 (16/48k Oric)

This game came to me on the other side of Dungeons of Intrigue, but is being sold as a separate piece of software with an 'Etch-a-Sketch' program on the other screen.

It’s a pity — I think I’d have really enjoyed this game; the overall presentation was good, the instructions were clear and straightforward and it looks as though it would be a lot of fun to play.

I’m sure that by the time you read this the production version will be on the market and the loading problems overcome — if this is the case I’d recommend that you take a look at Dungeons of Intrigue.

Presentation: Use of graphics: Addictive quality: Value for money:
ACE INVADERS
Supplier: Hi-Tech
Price: £6.50 (unexpanded Ace)

This is getting boring — again I had difficulty in getting this program to load, but in this case it was because of wrong instructions. The program loads in two parts and you have to type in four separate instructions for successful loading. The Ace distinguishes between upper and lower case and, whereas the instructions tell you to type 'LOAD GRAPHICS' this should really have been 'LOAD graphics'. The same thing applied to 'LOAD RUN'. Once I had realised this, it all worked okay.

Ace Invaders is — yes, you guessed — a version of Space Invaders. The limitations of the Ace graphics are painfully apparent and the keyboard is a nightmare for playing games — comparable only with the ZX81. In fact, I found using the Ace very similar to using the '81: the graphics are the same chunky blocks and the whole look and feel of the two machines are virtually identical.

You have control of a laser at the bottom of the screen, and the invaders move down in columns from the top of the screen to the bottom. Your laser base is moved by pressing the 'z' and 'x' keys, and you hit the 'm' key to fire.

You have the usual defences to hide behind, these can be destroyed by hits from your laser or from the invaders. There are 60 invaders in all, but you have only one life (with most versions you have three, or sometimes even five). At the slower speed hitting the invaders poses little difficulty, but the keyboard design makes it imperative for you to hit each key dead-centre. An optional fast version (type 'FAST RUN') speeds things up considerably. But, even so, it's hardly arcade action. Given the fact that this game is for the unexpanded Ace, and making allowances for the keyboard, this is a fair implementation. It compares well with Space Invaders for the unexpanded ZX81, but overall it feels like a step backwards — using a low-memory, black and white machine with a silly keyboard seems very strange after the advent of all the all-singing, all-dancing, full-colour, full-sound 48k computers now available. I suppose this is just snobbery: the Ace is a very nice machine for learning Forth and is certainly good value for money. I have been sent a couple of arcade-style games for the 16k Ace. Unfortunately I have not, as yet, managed to get my hands on a 16k expansion — when I do I will be looking at these games, and I am sure they will be considerably more impressive than Ace Invaders.

Presentation: 
Use of graphics: 
Addictive quality: 
Value for money: 

MICRO MAZE
Supplier: Hi-Tech
Price: £6.50 (unexpanded Ace)

Again the instructions are confused between upper and lower case, but once this is sorted out loading is straightforward.

Micro Maze is a simple Pacman-style game. You roam the maze, eating as many radioactive dots as you can and, keeping an eye open for the pursuing monsters. If you manage to clear one maze of all the dots, the screen clears and you move onto a higher level — with the monsters getting quicker, and much more likely to catch you. That's all there is to it — there are four levels of skill and you automatically move onto the next level as you clear the screen. You also have a choice of three mazes, which memory to very good effect.

It's a standard text adventure — you start in a small hut and have to wander through the various locations retrieving treasure. There are six valuable objects to be retrieved and it will take you a long time to complete the whole game — Tansoft reckons five hours for a seasoned adventurer and 50 or more for the novice. I fall very definitely into the 'novice' category as far as adventures are concerned; I lack the powers of concentration and patience needed for this sphere of computer gaming.

It's difficult to review adventure-type games without giving too much away; there is a good range of different locations, a large vocabulary of acceptable words, and plenty of detailed description. For example, if you find yourself in a room the Oric will tell you that it has high ceilings, a sturdy mantelpiece, and exquisite paneling which denotes that the house owner is a man of good taste and high financial standing. You are not restricted to simple verb/noun instructions — you can add descriptive adjectives which will have an effect on the way the computer carries out your orders.

Music is added at the relevant points of the adventure — at one location you come across a radio that is playing the theme tune from the Archers — but again I found that this detracted from my enjoyment as the sound did terrible things to the screen display. I assume that production Orios are now free from this most annoying feature; I live in hope that Oric will send me replacement ROMs so that I don't have to keep making this point in every review I do.

Sound bugs aside, this is a very nice piece of software. I am not an adventure addict, but I think that this is a game I would return to.

Presentation: 
Use of graphics: 
Addictive quality: 
Value for money: 

ZODIAC
Supplier: Tansoft
Price: £9.99 (48k Oric)

Zodiac is a full-length adventure for the 48k Oric. This time there were no loading problems — using slow format the program loaded successfully, but took half an hour to do so . . .

This is a well put-together adventure that features a very large vocabulary and which uses the large amount of available
The ubiquitous Peter Rodwell crossed the Atlantic for the great Californian non-event of the year; otherwise known as the West Coast Faire.

Hot air

'You should be writing an obituary, not a report,' said one exhibitor, surveying the crowds slowly ambling around San Francisco's gaunt Civic Auditorium, venue for the 8th West Coast Computer Faire. 'All the fun has gone out of it.'

And indeed he was right. There was no shortage of exhibitors (400-plus) or visitors (46,900 — a little more than last year's PCW Show) and could be counted a success numberwise. But there was something missing. There was nothing new, nothing that made you stop in your efforts to squeeze past vast Californian stomachs and gasp with astonishment or think, 'Gosh! This is where it's all really happening!' In short it was — dare I say it — rather boring.

In case you think that I'm so jaded by international jet-setting that not even a trip to California can get the adrenalin flowing, let me explain. I have in the last year attended shows in Britain (several), Amsterdam, Madrid and Tokyo and, with the exception of Amsterdam (Comdex, a terrible show), found something of interest, novelty, originality and/or amusement. Tokyo gave a fascinating insight into the Japanese home market and provided a preview of what we can expect to be pouring over here in the near future. Madrid had little in the way of innovation but made up for this with all the enthusiasm and vigour of what must be one of the fastest-growing micro markets in Europe. The British shows proved that we are the masters of software innovation and can still teach the Americans and Japanese some pretty strong lessons about designing and making hardware, too.

Travelling to California to visit the major micro show in the very heart of the industry, one expects even greater things. After all, this is where the industry started and where a lot of the innovating — in hardware if not in software — still happens these days. Perhaps I was expecting too much — although I don't think so — but I certainly left a rain-sodden San Francisco at the end of the Faire with a feeling of disappointment.

IBM PC monopoly

Oh, there were new products, all right, dozens of them, but new in being fresh on the market place rather than fresh in concept. And there were some enormous pointers to the way the American and European markets are diverging, mainly thanks to IBM.

Everywhere you looked at the WCF you found yourself staring at an IBM PC. Or at an add-on for the PC. You don't even have to talk of the 'IBM PC' in the States now — it's simply the 'PC', and at times you feel that there might as well not be any other micros around. The popularity of the IBM in the States actually poses a problem for us in some ways. It was obvious at the Faire that any software producer will now turn out his product for the PC first and for other machines later, if at all. But because Californians are, mostly, hardly aware of the existence of the rest of the USA, let alone the rest of the world, they seem to assume that the dominance of the IBM extends to cover the entire globe in exactly the same manner in which it now seems to dominate the States. In America, the starting price of the IBM is so low that the machine appeals to the middle of the home market right up to the upper half of the business world and, of course, it has been on sale for the last 18 months or so. As we all know, in Europe, things are very different: the machine has only just gone on sale and is grossly over-priced, putting it firmly at the top end of the business market. That the Americans don't appreciate this was made obvious by the number of software houses at the Faire who seemed keen to sell their IBM games on the European market and by

High technology has hit the instant portrait world — this artist was using an Apple III with graphics tablet, colour monitor and colour printer to churn out portraits.
Cruising down El Camino

It's a standing joke in the PCW office that West Coast Fairie reports always start off with 'As I was cruising down El Camino Real ...' as a reference to the road which snakes down from San Francisco through Silicon Valley. As it happens, I did eventually cruise along it, in pouring rain, searching for the Palo Alto Hyatt (which turned out to be booked solid with Apple sales reps - I ended up in a sordid motel next door). But I started my expedition by heading in exactly the opposite direction, across the Oakland Bridge to the University of California's Berkeley campus to visit the Instructional Technology Unit.

The Unit is an offshoot of the Humanities Computing Service and aims to spread technology awareness among students and faculty, to provide access to microprocessors (and the CPUs of most microcomputers, too) use the binary machine code instructions as addresses to look up a much lower-level code, held in microcode directly. The result is said to be a speed increase of three to five times over conventional microcoded processors.

Berkeley's Professor Brian Barsky is one of the leading experts in computer graphics. While on the campus, I took a nose around the building, the interior walls of which are decorated with ancient Icelandic characters.

While on the campus, I took a nose around the computer building, the interior walls of which are decorated with examples of computer graphics printouts, including a floor-to-ceiling blow-up of the HP 3000's instruction set (Ron Barsky is the Unit'sInstruction Set Computer) microprocessor. This chip, developed at Berkeley, is designed to eliminate microcode. Currently, most microprocessors (and the CPUs of most other computers, too) use the binary machine code instructions as addresses to look up a much lower-level code, held in ROM on the chip; it is this microcode which opens and shuts the various networks of logic gates on the chip to carry out the actual instructions. The RISC chip cuts out microcode and instead requires special high-level language compilers which effectively produce the microcode directly. The result is a speed increase of three to five times over conventional microcoded processors.

Portability

It took the full three days of the Faire to visit every stand, look at whatever was on show, and, where necessary, talk to the people giving off its new home machine, the TI-99/2A, an under $100 micro with 4.2k of RAM (expandable to 36.2k). TI Basic in ROM and a black and white display. The display gives 24 lines of 28 characters and there's a promised range of peripherals which include a printer/plotter, a 'Wafertape' mass storage device and an RS232 interface. I also picked up a brochure on — but don't remember seeing the TI Compact Computer 40, aimed obviously at the Epson HX-20 with a built-in 31-character LED display (single line), 6k RAM expandable by 16k, 32k of ROM and the same peripherals as the 99/2. It can also take software in the form of ROM cartridges and its suggested retail price is $249.95.

Some diversions

But enough of this negative talk. There were, in fact, a few things of interest at the Faire even if they weren't revolutionary advances in computer science. My personal 'best in show' award went to the Vectrix Corporation for its spectacular colour graphics add-on subsystem powered by its own ROM and producing some really spectacular displays. It can, apparently, be used with virtually any microcomputer and can easily be controlled from whatever high-level language you like. Regrettably, a pretty impressive collection of Californian beer guts insisted on foisting my camera and lensing. I didn't like the quality of the getting-there photo of the demo display, so you'll have to wait until we Benchtest it — it will be on sale here soon.

Nearby, a small stand was attracting attention by showing a small computer called the Humdinger. The Americans seemed thoroughly impressed by its lowish resolution colour graphics, its 4k of RAM and — most of all — by its $129.95 price tag. I, too, was impressed, although as a Spectrum owner slightly less so, as I couldn't but wonder why they hadn't put the price up very slightly and given it a lot more RAM, thereby putting themselves in a good position to give Sinclair a run for his money. But — name apart — there's nothing to sneer at about the Humdinger and the large range of add-ons which include disks and CP/M as well as memory expansion and extra I/O ports should make it a popular choice. 

But - name apart — there's nothing to sneer at about the Humdinger and the large range of add-ons which include disks and CP/M as well as memory expansion and extra I/O ports should make it a popular choice.

Quickly masking his obvious annoyance over conventional microcoded processors, Barsky has introduced a system for 'smoothing out' the facets, incorporating a 'tension factor' which allows you to vary the amount of smoothing, from very angular to completely smooth. He demonstrated this with a very impressive display of several objects, including an irregular one, each object incorporating a 'tension factor' which allows you to vary the amount of smoothing, from very angular to completely smooth. He demonstrated this with a very impressive display of several objects, including an irregular one, each object with varying tension factors; as always, they had a strange, unearthly look to them which, it later occurred to me, was because they were 'too perfect' — real-world artefacts have slight imperfections, but introducing this to a computer graphics system would, I imagine, be a departure from trivial. The Berkeley graphics work is very, very impressive and I can't wait for hardware prices to fall to the point where we can achieve this sort of thing on personal computers. I left promising that next time I was there I'd make an appointment and go into the subject in greater depth — and I will.
relevant people. Before long, the two big trends in current hardware became apparent. Everywhere there were IBM lookalikes, portable computers and, in quite a few cases, portable IBM lookalikes from those riding both bandwagon. I must confess that I have long suspected that the success of the Osborne owes more to its price and bundle of software than to its portability; despite the very large number sold, I have never actually seen anyone using a portable machine in anything other than the sort of environment — office or home — where mains power is available and where a proper business machine would serve them far better. I am prepared to admit that some people need — and might even use — a truly portable computer, but I see no evidence that the success of the portable is due to its portability. Surely, though, I must be quite wrong for everybody is producing portables, often costing much more than the Osborne and offering less software, although, to be fair, they are usually better made and have larger screens. Given that the portable is selling well and that the IBM is moving in telephone number quantities in the States, it's hardly surprising that IBM-compatible portables should be the machine to make. Most seem similarly priced to the IBM and offer slightly more, particularly in the way of I/O ports. The nicest looking at the Faire was the Canadian-made Hyperion, now available in the UK from Gulfstream Technology and in the guise of The Ajile from Anderson Jacobson.

There were also several 8-bit portables, of which the best, in terms of portability and aesthetics, remains the Otrona Attaché, seen in prototype form in this country in 1981. When I eventually managed to speak to somebody on the Otrona stand, I was disappointed to learn that the company is not at present very interested in European sales as it can sell all the machines it can make in the States. A pity, because as it costs almost twice as much as an Osborne, its success over here would neatly disprove my theory. (I don't count its success in the States — they've all got more money than we have and they seem to enjoy carrying portable computers back and forth between office and home.)

**Mice mania**

The other big craze at the Faire was for mice. Since the announcement of Lisa, with its graphics screen and mouse, everyone has decided that they must have a mouse and, of course, making mice for the IBM PC is particularly popular. I tried a mouse and was puzzled; it worked just fine but I couldn't quite see why it has become so prevalent. It's supposed to make it easier for laypersons to select from a menu or generally move around the screen. Positioning the mouse takes a little practice and you then have to press a little mouse-mounted button to tell the computer that you've arrived at your chosen location. I'm puzzled because I think a touch-sensitive screen or light pen would be far more sensible for several reasons: you make your moving and selecting in one go; there are no

One of the host of new portables around was this one, the Access, which comes complete with a dot matrix printer welded onto its top, making it even less portable (because of its weight and power requirements) than most.

A roomful of Victors and Sirius is undergoing soak testing and generating an amazing amount of heat at the same time...

**Down in the valley**

'You are now on the world's most beautiful freeway' said the sign on Interstate 280, leading south from San Francisco; well, it was quite spectacular but I can think of at least three which are more beautiful. It lead, eventually, to Scotts Valley, well south of Silicon Valley, where Victor — manufacturer of the Sirius — inhabits several stylish buildings in the middle of a deeply-forested and very attractive piece of California.

The production facility at Victor is surprisingly small, but it is really only an assembly operation. All the PCBs and the keyboard unit are manufactured by outside contractors and the various parts are simply slotted together at Victor. Perhaps the most impressive part of the operation is the testing room, where every machine is soak tested for 24 hours in the case of floppy-based machines and 48 hours for hard disk machines. The room is crammed with computers — all in various stages of testing — and is hot — the air conditioning simply can't cope with the heat generated by 200 or more computers, it seems. Regrettably, the software guru I principally wanted to talk to had been called away urgently and a tight schedule prevented my waiting around to see him. I did get to talk to the hardware vice-president, though, and was pleased to learn that the 8087 maths coprocessor board and the clock-calendar board are ready and should be here soon. There is still no apparent progress on a colour display for the Sirius, though; it seems that there isn't a reasonably-priced tube which can handle such high resolution graphics in colour and Victor would rather go this route than immediately offer either a lower-resolution display at a reasonable price or a high-as-monochrome resolution display at an extortionate price...
moving parts to wear out; the software is far simpler, and you don't need to keep an area clear on your desk top. The situation is especially silly when you consider that many modern display controller chips contain built-in light pen interfaces anyway.

**Colourful display**

In many areas of microcomputing, the hardware has kept well ahead of the software, simply because it takes time for programmers to learn their way around new chips and systems. One area in which the hardware is definitely lagging is in really high resolution colour displays at affordable prices. Thus, while there were many spectacular games at the show, the Tempest machine in my hotel outshone all the micros in the quality of its graphics and it looks as though we'll have to wait another couple of years or more for the price of RAM chips and the 16-bit processors to address them to fall sufficiently to make their use in home machines economically worthwhile. Meanwhile, it's quite possible to produce some pretty impressive stuff on Apples (especially the IIe), Tandy Color Computers, Ataris, Commodores and, again, IBM's, as was amply demonstrated at the Faire. More than amply, in fact, for the games market Stateside is booming just as it is here and the sounds of electronic zapping, crashing and exploding filled the air. Most of the games were ones we have already seen here (apart from a few on the IBM) but it was nice to see the British Thorn EMI games for the Atari machines on show and attracting big crowds.

**Light relief**

If the Faire was lacking in novelty and originality productwise, it still provided occasional flashes of entertainment in the form of the people there. There were of course the usual promotional gimmicks: I spotted a caveman, a penguin, several robots, an ET and a gorilla (or he might have been a bear — it was difficult to tell). And of course the Great American Computer Nerd was out in force, bedecked in long hair, lumberjack shirt and small, flacid rucksack. The GACN could be found everywhere, but seemed particularly prevalent around stands like the one promoting the use of micros to advance world peace, or near what the Americans called catering facilities: booths selling foul-looking Mexican-style things to eat and the usual repulsive, diuretic fluid they call coffee. Even Earl's Court or the worst excesses of British Rail produce better food than the villains who have the Civic Auditorium catering concession; the Faire organisers collaborated by providing no alternatives for us pampered press people, either. In fact the press 'facilities' were the worst I've ever seen: a stark room with hard chairs and a few trestle tables for press releases. Smoking was banned in the press room, too — a measure which would provoke an immediate walk-out at any European show!

**Conclusion**

In summary, then, was it an event worth flying the Atlantic to see? My answer would have to be a qualified 'No'. Had I gone to California just to see the Faire in the expectation of great things, I would have been even more disappointed. Fortunately, the presence of Silicon Valley just down the road meant I could make up for the Faire by visiting one or two interesting places (see the box elsewhere in this report) and generally mooch around some computer shops to see how things are done there. If this year's Faire is a guide, there would seem to be little point in going to next year's event. And it appears I'm not the only one to be disillusioned with the Faire: organiser Jim Warren is said to be negotiating for the sale of the whole thing and may even have sold it by the time you read this, in which case some sort of an era will definitely have come to an end. Personally, I feel that the rest of the industry has changed but the Faire has tried to stay the same, and that the traditional gap between the USA and Britain in computing developments has narrowed almost to insignificance. In fact, one comforting aspect of the Faire was that it showed — and talking to people there reinforced this — that in some areas we're calling the tune from this side of the Atlantic and they may even start taking us seriously soon.
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I take it as evident that most PCW readers are smart enough to walk and chew gum simultaneously. Most microcomputers, however, are not. In the real world lots of things tend to happen at the same time, to the point that we take such behaviour for granted and seldom question it. When you make breakfast, it’s quite natural to have the toast under the grill at the same time that the eggs are boiling and the tea is mashing in the pot.

In other words, concurrency is not an issue in the real world; it’s the way that the space/time continuum which we inhabit operates. It becomes an issue, however, when we try to model this world using a computer because the CPU of a microcomputer (at any rate of a microcomputer) can only do one thing at once. At the machine level it can only execute one instruction at a time in the order which the program counter dictates. When machine instructions are bundled together to form the statements of a high-level language such as Basic, this underlying linearity remains. The statements of a Basic program are executed one after the other and the working of a Basic program can always be understood by an imaginary ‘finger of time’ which runs through the source code and points to what is happening now (when you are debugging a program this is often your own finger in a listing).

Why concurrency?

Why should we want the computer to do more than one thing at once since it does things so fast anyway? Anyone who has tried programming games in Basic can give one reason immediately, while your program is updating the screen it can’t be doing anything else. So, if you require constant inputs from the user, all you can do is program a loop in which the input and updating are done one after the other but repeatedly; the result is not very fast or smooth.

This demonstrates an important reason for desiring concurrent processing in a computer; in a ‘real-time’ system such as might be used to track Exocet missiles or to control a nuclear power station (our game is just a simulation of such a system), the computer must simultaneously receive inputs, process information and control outputs. The computer cannot ask the inputs to ‘hold on a minute till I’ve finished typing’ since Exocets are notoriously bad mannered in this respect.

Another reason, more applicable to business and domestic uses of micros, is that the convenience of use of word-processors, databases and the like could be enormously improved if it were possible to run more than one application simultaneously. You could, for instance, order a search of a large database for a piece of text to insert into a document, and carry on typing while the search took place in background without having to wait for its completion. Some word-package processors already have the ability to print in background while you continue to type.

So how is concurrency achieved? Either by having more than one processor or by cheating on a single processor. By cheating I mean that a program is written so that the tasks which are to run simultaneously each get a share of the processor’s time; the processor executes one instruction from each process in turn. It’s cheating because instructions are still executed sequentially, though the overall result is the appearance of concurrency and, of course each task executes more slowly than it would have on its own; if there are three, each will run at a third of its full speed). The proper name for such cheating is time-slicing; many real systems are more complex than this simple-minded scenario and use interrupts as well.

The approach of using more than one processor is used in big defence mainframe systems and in a more modest way in the Atari, the T99 and the Commodore 64 which achieve their concurrent graphics processing (‘player/missile’ or ‘sprites’) by using ‘smart’ video chips.

To use the cheating method on a single processor by writing at the assembler level is a nightmarishly difficult programming task; each task must be conceptually isolated from the others and must leave all the registers used by other tasks in the correct state. One way of simplifying this job is to use a concurrent operating system such as the new Concurrent CP/M. This will have in it a real-time monitor which does the donkey work of separating tasks, allowing them to communicate by flags to achieve synchronisation and to transfer data between themselves through FIFO (first-in-first-out) queues. This still presupposes writing at the assembler level. Mark Holmes’ article on the BBC Micros Event Queue in PCW (April 1983) gives some idea of how this sort of programming works.

A quick note on terminology; concurrent, parallel and multi-tasking are all words with rather different shades of meaning which tend to be used interchangeably to describe the sort of programming with which we are dealing. Concurrent implies only the notion of simultaneity, parallel processing more usually refers to hardware architectures than to software (Inmos people use it because they are concerned with both), and multi-tasking is mainly reserved for describing operating systems.

To achieve concurrent programming in a high-level language, the facilities have to be built into the language. The most well known example is Ada, which has a program construct called the ‘task’ for this purpose. Tasks communicate by shared variables and by flags (often called semaphores). Some Pascals have a similar construct called a ‘process’. A task or process is a piece of program which can be executed in parallel with other such pieces.

**Occam’s razor**

Inmos, Britain’s great white hope in the semiconductor industry, is working on a new computer called the ‘transputer’ which is due to be unveiled later this year. Few details of the machine are available beyond the fact that it will be used in networks and makes use of the concept of parallel processing.

Occam is a new systems programming language developed by Inmos’ programmers specially for the transputer, though it’s equally applicable to other machines. Occam is possibly the first language dedicated to the concept of parallel programming; the parallel constructs are part and parcel of its structure rather than optional extras. The intention of Occam is that the programmer should not have to care how concurrency is achieved as the same Occam program will run on a single processor (by cheating) or with multiple processors (a separate processor for each task).

The name Occam is taken from the 14th century Oxford philosopher of that name who gave us Occam’s Razor; the principle that entities should not be multiplied further than necessary, which means that of competing equally likely explanations, take the simplest. One of the most cogent critics of Ada, the US Defence Department’s adopted language, has been Dr Tony Hoare, who has been intimately involved in the design of Occam. Ada is a huge language with everything including the kitchen sink. Much of its size comes from the need for absolute security in defence related programming; Ada takes the Pascal
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HOW OCCAM WORKS

The sort of security required for real time systems is concerned with the isolation and synchronisation of concurrent processes; processes must not interfere with each other's data, they must not collide when competing for resources, and they must be ready at the right times if they are to communicate. Occam achieves these goals in a characteristically elegant way by completely separating the functions of storage and communication. The two fundamental data structures in Occam are the variable and the channel; variables store data and channels transfer data between processes. From a physical point of view these two may be identical as each consists of a one word memory location but they are logically distinct. (I tried Occam on the Sirius which has 16-bit words but this feature is implementation dependent; many Occam systems will be 32-bit.) Some channels will, however, be ports to the outside world, fixed in the particular Occam implementation, while others will be locations for exchange of data within the computer and can be declared as needed like variables.

The unit of Occam programming is the 'process'. A process performs a sequence of actions and then terminates. Note the time element creeping in here; in a Basic program you never think about a program's time element, whereas in Occam the concept of actions and then terminates is one of Occam's constructors, and it declares that what follows will be executed SEQuentially as in an ordinary Basic program. The indentation is not optional but highly significant as it indicates the scope of the SEQ construct. Occam has a smart editor which, in addition to checking syntax, handles this indentation for you automatically. This program inputs on channel comm1, adds 100 to the input value and outputs it to comm2, doing this once only. (The assignment is actually redundant as I could just say comm2 := comm1 + 100.)

Communication on a channel is one-way only between any pair of concurrent processes, and it's synchronous. Communication can only occur when both the input and output processes are ready; if either reaches its input/output stage before the other is ready, then it will wait. This waiting is automatic and transparent to the programmer, no flags or semaphores to worry about. The program above could be made into a named process by declaring it so:

```
PROC add100 (CHAN comm1,comm2) = VAR temp:
  comm1 := temp;
  temp := temp + 100;
  comm2 := temp;
```

A semicolon is now needed at the end because this is a declaration; that and indentation are the only delimiters used in Occam. This process can now be used inside another so:

```
SEQ
  comm1 := temp;
  temp := temp + 100;
  comm2 := temp;
```

The actual channels to be used are declared in the body of the formal parameters comm1 and comm2.

Things start to get more interesting when we come to the other Occam constructors PAR, ALT, IF, and WHILE. PAR states that the following processes should be executed in parallel, i.e., simultaneously. WHILE is the way of producing looping until a condition is met.

```
PROC add100 (CHAN comm1,comm2) = VAR temp:
  WHILE temp <= 0 SEQ
    comm1 := temp;
    temp := temp + 100;
```

This process will now repeatedly read from comm1 until a value of 0 is input. To repeat indefinitely, which is often what is wanted, I could have said WHILE TRUE. From now on — for brevity — let's omit channel declarations and assume that they have been made earlier in the program.

An example of parallel processes is:

```
WHILE TRUE
  VAR x:
  SEQ
    comm1 := x;
    comm2 := x + 100;
```

The first SEQ process continuously monitors the input from comm1 while, at the same time, the second SEQ monitors comm2. Both then output to another channel. The two processes do not communicate with one another but if comm3 were to be replaced by comm2 then they would. Note that the order in which the two SEQ processes are written is totally irrelevant here; they execute together.

PAR, for ALTemative, construct is absolutely central to Occam. It says that — of the list of processes which comprise its body — execute the first one which is ready:

```
WHILE TRUE
  VAR x:
  ALT
    comm1 := ANY;
    SEQ
      x := x + 100;
      TRUE
```

This will add either 1 or 100 to x depending upon which of comm1 and comm2 produces its input first; the input processes which ALT selects from are called 'guards'. Should both guards come ready simultaneously, then Occam will

```
CHAN values[n+1]:
PAR
  VAR i = [0 FOR n] WHILE TRUE
    VALUES (n) := VALUES (i) + i/2
    VALUES [i+1] := VALUES [i] + VALUES [i+1]
  ENDWHILE
  VALUES [n] := 0
  VALUES [n+1] := n
```

Fig 1 Newton-Raphson calculation of square-root using parallel processing.

```
PAR
  VAR root = 0;
  SEQ
    root := VALUES [n] / VALUES[n+1];
    root := root + VALUES [n+1] / VALUES [n];
  ENDSEQ
  root := root;
  TRUE
```

Fig 2 The Occam reserved words
There's so much to choose from.
But only one choice to make...

Software Limited. Simply because we've got one of the largest stocks of CP/M Software in the country. And it's available straight off-the-shelf to cover the major formats.

Our expert advice and comprehensive catalogue, make certain that the very latest Technology will work hard for your business.

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London EC1

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CP/M is the trademark of Digital Research.
choose one arbitrarily to execute. ANY is a dummy variable which throws away the input value; only its presence or absence matters as a signal. This is the stuff of which real-time control systems are made. The power of ALT is increased by the option to put a condition in front of the input process in a guard:-

ALT

x < 0 & comm1 ? ANY

Each guarded process can only execute if its guard is TRUE which means it must be both ready with a message and the condition must be TRUE.

Real time processes

Real-time can be introduced by using the WAIT process instead of an input process as a guard. NOW is a system variable which contains the time of the system clock. AFTER is an operator which compares times; time1 AFTER time2 is either TRUE or FALSE. So one can write:

VAR alarm:

SEQ alarm := NOW + 100

HALT comm1 ? ANY

SEQ — some action

WAIT NOW AFTER alarm

SEQ — ring a bell

The action performed depends on whether a message is received on comm1 before the WAIT comes TRUE after 100 time units.

The IF construct is very simple, with nofanction. It begins with a condition and IF executes the

SEQ i = [1 FOR 20]

STRING i = "what the hell"

SEQ x = 0

PRINT x = 1

printer ! y

Using these simple but elegant constructs it's possible to write virtually any program, but it will tend to be very long. A cunning device called the 'replicator' allows much better economy of expression. A replicator may be used with any of the constructs mentioned above to — well — replicate the process a stated number of times. This is the equivalent of a FOR. NEXT is created by:-

SEQ i = [1 FOR 20]

SCREEN! i

This will output the numbers 1 to 20 to the screen. Used with PAR, it is possible to create an array of parallel processes:-

CHAN k[i+1];

PAR i = [0 FOR n]

WHILE TRUE

VAR x:

SEQ:

k[i] ? x

k[i+1] ! x

This process creates a queue with room for n elements by passing the input value along to the next highest numbered channel in the array. A good example of the Occam style of programming, presented in the manual, uses such an array of processes as a pipeline to perform square-root evaluation by Newton's approximation on a list of numbers; calculation takes place in parallel, the next number on the list being input and the approximation cycle begun before the previous one has finished. This results in an overall improvement in throughput compared to the normal iterative solution even when using a single processor by time-slicing. For the benefit of those with the patience to unravel its workings, I reproduce the listing in Fig 1.

A replicator with ALT allows input from an array of channels to be concisely programmed:-

WHILE TRUE

VAR x:

ALT i = [1 FOR 100]

chan[i] ? x

OUT x

Input from the array of channels is funnelled into a single output channel; a sort of demultiplexer.

Data structures

You have just seen another type of Occam data object: the array. Arrays of channels or variables can be constructed by adding the upper bound in square brackets when declaring them, eg, VAR array [10];. If the word BYTE is included, a byte rather than word array results, eg, VAR alphabet [BYTE 26].

String handling in Occam is performed by treating them as byte arrays, which will be familiar enough to Forth programmers. Constants and tables of constants can be set up with DEF, eg: DEF interval = 100: or DEF squares = TABLE[1,4,9,16]. (Hex values are introduced with a $, eg, $1c).

The input/output facilities in Occam are minimal, as in C or Forth, so, to print a string to the screen, you need a routine like:-

DEF print = "what the hell"

SEQ i = [1 FOR string] BYTE 0]

SCREEN ! string

Note that the first byte of string contains its length. In practice, a routine to do this (called str.to.screen) and many other utilities — such as file I/O — are supplied in a library. PROC str.to.screen would be used in a program as:-

PROC str.to.screen("what the hell")

Processes named with PROC can accept as parameters either variables, channels, values, or arrays of any of these. The size of an array need not be declared in the formal parameter list of a process so that arrays of variable size can be passed. For instance, the formal parameter list of str.to.screen is:-

PROC str.to.screen(VALUE string) =

The compiler

The version of Occam on which this brief survey is based is a 'preview' product called "proto-occam" which is meant only as a sample of the full language. It runs under the UCSD p-system on Apple, Sirius, IBM PC, VAX and LSI-11/23.

Occam is a compiled language but the compiler is rather out of the ordinary. It is a single pass compiler with an embedded intelligent screen editor, and in use it's almost like an interpreter. The source program is written using the simple but effective screen editor which automatically indents by the correct two spaces every time you use a constructor like SEQ. Issuing the 'check' command performs the lexical analysis stage of compilation and reports syntax errors by placing the cursor at the site of the error. This can be performed after you enter each line, if so desired. Only when your program has checked ok, are you allowed to issue the 'generate' command which completes the code generation pass after which the object file (p-code in this case) can be written out to disk.

The main features lacking in the Evaluation version are any facility for separate compilation and linking of modules, and the ability to directly address memory locations. The latter is necessary if you wish to create new 'real-world', as opposed to internal, channels by, for instance, accessing an RS232 port. The sample version comes with just two such channels implemented, namely screen and keyboard; printed listings are only available by using the p-system utilities. Incidentally the Occam Evaluation Kit is reviewed in full in issue 1 of Soft Ed.

Occam is a very easy language to learn and use; its syntax is so simple and consistent that it can be learned in half an hour by anyone who is familiar with Pascal. It is cleverly designed to allow constructs of great power to be produced from a relatively small number of primitive entities. Many of the latest ideas on structured and applicative programming have been incorporated but not so many that they render it difficult or frustrating to use as a 'dirty' systems programming language. Its security features stem in an elegant and natural way from its control structures without the need for bundling the programmer hand-and-foot with restrictive afterthoughts. If it has any serious shortcomings then I certainly do not have enough experience to have discovered them (I've no doubt that the PCW mail-box will feel the strain if there are any!). As an educational tool to introduce the concepts of parallel processing it is superb, and it seems small enough to be effectively implemented on the latest generation of microcomputers; the p-system evaluation version is rather slow but native code versions would presumably be a lot faster. Don't lose sight of the fact though that there is no such thing as a free lunch; parallel processing on a single processor can rarely result in much overall speed gain. Multiple processors are what Occam is really all about.

Whether or not it is already too late for Occam remains to be seen; the US Defence Department's endorsement of Ada is a formidable obstacle but if there is any place left for aesthetics in computing, then it deserves to succeed. If you believe, as I do, the Bauhaus dictum that 'form follows function', then it is perhaps not such a bad criterion.
HEARING IS BELIEVING

Peter Rodwell checks out a new piece of audio hardware — the Compact Disc — which will be beneficial to the computer industry.

What, you may well ask, is a chunk of audio hardware doing being reviewed by PCW? It has, after all, nothing at all to do with computers.

Well, that's a fair comment in a way but the latest revolution to hit the audio industry in fact owes its existence to the computer industry and may well become a vital computer peripheral in the near future. And, in any case, the whole thing is such a neat piece of technology that it ought to interest any technofreak simply because it's such a good idea.

For decades, people have been spending an awful lot of money trying to reproduce recorded sound as faithfully as possible in the comfort and privacy of their own homes. The last great revolution went out of the picture with the LP record and shortly after that the widespread introduction of stereo sound. Both brought immense improvements over the previously popular medium, the 78rpm record, in terms of frequency response, dynamic range and reduced noise. Corresponding developments to other parts of the audio chain — microphones, tape recorders, amplifiers and loudspeakers — were already in place.

But good though these methods are, they still haven't given us really good sound — there's always some degree of distortion and background noise introduced at the various stages in the process.

A new technology has now emerged which does allow the capture, storage and reproduction of sound without such massive risks of degradation. By digitising the sound as near to its source as possible and then storing it in digitised form, it's possible to reproduce it with no audible difference to the original; the method which has been developed to do this is the Compact Disc (CD hereinafter).

How it works

Sound is transmitted through space in the form of variations in air pressure; these cause our eardrums to vibrate in sympathy and we perceive this as a sound of one sort or another. Variations in pitch and other qualities which allow us to recognise the difference between, say, the sound of a violin and that of a randy tomcat are caused by variations in the pattern of these pressure waves.

The diaphragm in a microphone acts like our eardrum — it vibrates in sympathy with the pressure waves which make up sound, but it converts these to an electrical signal, the voltage of which varies as the sound varies. The signal produced by a microphone is quite weak but if we strengthen it sufficiently with an amplifier, we can reverse the process by feeding it to a loudspeaker, which converts the signal back into pressure waves. Results are predictably, the three components in the system — microphone, amplifier and loudspeaker — never produce an exact copy of the input signal and the result emerging from the loudspeaker will always be distorted to some degree. In the recording/playback processes used to produce an LP, there are many more stages than this and therefore many more stages in which distortion can occur.

The digital techniques used in the CD system allow a far more faithful level of sound reproduction. To digitise sound, the analogue signal is 'sampled' as soon as possible after it has been obtained. To get an accurate digital representation of an analogue signal, you need to sample it at a rate of at least twice its frequency. The audible frequency range is from 20 to 20,000Hz so the CD system uses a sampling frequency of 44.1kHz which is more than adequate, and each measurement results in a 16-bit binary number.

The digitised signal is stored and distributed on a 12cm diameter disc quite unlike the LP record. One side of it is covered by a label while the other, the playing side, has a silvery sheen. Although you can't see it, what you're looking at is in fact a spiral track of pits in a thin aluminium disc, contained in a protective, transparent plastic covering. The disk is read by a small laser in the player and the pits cause the reflected laser beam to effectively flash on and off in sympathy with the pits' binary pattern. A photo detector captures this and a digital to analogue converter turns the signal into audio.

This is of course a grossly simplified description of the way a CD player works. There are plenty of complications, such as keeping the laser aligned with the track, and — the CD's strongest point — error correction, which not only maintains the fidelity of the resulting sound but helps reduce background noise such as scratches or minor imperfections on the disk. Small scratches or fingerprints on the transparent coating do not affect the sound quality at all, for the laser is focused on the aluminium surface behind them and doesn't even 'see' them. Short scratches which are deep enough to affect the laser beam can be dealt with by the error correcting circuitry, but of course there is a limit to what can be compensated for by electronics and a really bad scratch will give problems. Generally, though, the CD discs themselves are far more robust than LPs and, because they are not in contact with anything like a stylus, have an almost indefinite lifespan. Because it is so robust, the same disc will be usable in other types of CD player: car stereos and portable players are expected to appear in due course.

In use

I first came across a CD player in a department store in Tokyo and was astounded at the sound quality it produced. In fact, it was only the presence of Epson UK marketing manager Rob Stead which stopped me from buying one on the spot — we had previously agreed to pre- vent each other (forcibly if necessary) from spending any money while we explored the Tokyo equivalent of Tot- tenham Court Road.

To check on whether that first impression was accurate, I borrowed a Philips CD 100 player, the bottom of that company's proposed line of CD players, with a suggested retail price of £499 (the Sony...
player in Tokyo was selling at about £330).

Yes, my first impression had been right: the sound quality from these players is staggering, with a depth and realism which immediately make the LP obsolete. In fact so enthusiastic was I that I rushed out and bought another couple of discs (they're about £10 each, rather cheaper than a high-quality conventional LP and providing considerably better sound) on the grounds that I'm sure to end up buying a player one day.

Like all the other CD players now being sold, the Philips model plugs straight into your existing amplifier. All you are in effect doing is adding a second turntable - there's no need to junk your hi-fi system and buy a new one.

The selection of discs available now is quite good, although a little thinly distributed around the good shops, and most European record companies will be producing recordings on CD format as well as LPs from now on. The exception is EMI, which isn't convinced that the CD will catch on, but EMI wasn't convinced that the LP would catch on either, and had to catch on, but EMI wasn't convinced that European record companies will be pro-

Quite good, although a little thinly distri-

and buy a new one.

Effect doing is adding a second turntable -

your existing amplifier. All you are in

to tap into the digital signal stream before it gets converted to analogue form. The Philips player has no such outlet but this is hardly surprising: the CD market has only just begun in Europe (it's booming in Japan, apparently) and it will take time to gain acceptance and become familiar on the audio scene. Only then can we computer femet our hands on it, but if I were a software house or an electronic publisher, I'd be looking hard at CDs right now.

In the meantime, if Santa Claus is a PCW reader, you know what I want for Christmas, squire!

**NUMBERS COUNT**

Mike Mudge muses mathematically.

An increasing sequence of positive inte-
gers consists of a list of such integers, separated by commas; it is read in the conventional way from left to right and each number is to be smaller than that which follows it.

This work is concerned with certain non-terminating (or infinite) sequences which will be written \( \left\{ u_i \right\} \) as 'short-hand' for \( u_1, u_2, u_3, \ldots \). The first two positive integers \( u_1 \) and \( u_2 \) will be given and the sequence is to be continued by including only those integers which can be expressed in just one way as the sum of two distinct earlier members of the sequence. Such a sequence is named a U-sequence after Stanislav M Ulam. Details will be given for the fundamental U-sequence defined by \( u_1 = 1 \) and \( u_2 = 2 \) although obvious generalisations are possible. \( \left\{ u_i \right\} = 1, 2, 3, 4, 6, 8, 11, 13, 16, 18, 26, 28, 36, 38, 47, 48, 53, \ldots \), \( u_{100} = 690, u_{500} = 5685, u_{1000} = 12294 \).

**Questions**

Note: These are based upon the work of Bernardo Recamán, American Mathem-


(i) When is the sum of two consecutive terms of a U-sequence also a member of that sequence?

For the fundamental sequence \( u_1 = 1, u_2 = 2 \).

(ii) Which positive integers are not the sum of two terms of a given U-sequence?

If you think that £500 for a newfangled record deck on which you can't play your existing LPs is too much, well, my guess is that while there might be some cost-cutting in the Tottenham Court Road, the price will probably stay pretty much the same in figures, and the effect of inflation will be to make it cheaper in real terms - rather in the way that colour TV prices have behaved. The revolution won't happen overnight, either, but I would be prepared to bet that within five to seven years, we'll see a CD player in as many homes as are now have colour TV sets. Which brings me on to the real reason for sneaking a piece of audio equipment into the pages of PCW.

When (not if) CD players reach the same level of penetration that conventional audio equipment now has, we will suddenly have a unique and fairly inexpensive medium on which to publish computer software and electronic data of all sorts. Conventional optical disc wis-dom says that the laser video disc, currently enjoying a mini sales boom in the US but apparently a disaster here, will be the way of distributing computer-readable information. A video disc can hold, typi-cally, 2 gigabytes of data compared to the CD format which I estimate can store about 30 megabytes or so - it's difficult to tell because information isn't held on them in as straightforward a way as on a computer disk. But although read-write video disks are already in the laboratory stage and expected to hit the High Streets one day, it will be the CD which gains widespread acceptance first and which gains the widest-spread acceptance.

Because it is so much more robust than a computer disk, a Compact Disc offers a very rough, low cost-per-bit medium for distributing software and large databases of information such as encyclopaedias, books, knowledge bases for expert systems, etc. All that is needed is an output from the player which allows a computer to tap into the digital signal stream before it gets converted to analogue form. The Philips player has no such outlet but this is hardly surprising: the CD market has only just begun in Europe (it's booming in Japan, apparently) and it will take time to gain acceptance and become familiar on the audio scene. Only then can we computer femet our hands on it, but if I were a software house or an electronic publisher, I'd be looking hard at CDs right now.

In the meantime, if Santa Claus is a PCW reader, you know what I want for Christmas, squire!

**Lucky numbers winner**

Major errors of presentation prompted a considerable initial response from as far afield as Luxembourg, Derby, and Chichester.

All programs eventually submitted were written in Basic; hardware including PET, TRS-80, BBC and Spectrum A, the latter having been run for four days...

Various algorithms were designed for the construction of the desired sequence of lucky numbers, counting twin luckies and expressing even integers as the sum of two such lucky numbers.

The 'best' entry has been chosen as that of K P Leary of 2 Grove Vale, Chiselhurst, Kent BR7 5DS, whose presentation deserves particular commendation both for its content and its appearance, attributed jointly to Tandy Scripsoft and an Anadex WP0000 printer in correspondence mode.

A suitable prize will shortly be on its way to Chiselhurst.

The prize-winning investigation provides further empirical evidence for the Goldbach-type conjecture relating to lucky numbers, also for distribution theorems analogous to those for primes relating both to luckies and twin luckies. At the time of writing, however, analytic proofs of these results seem as remote as they ever were.
Looking to enhance your Spectrum's capabilities? Steve Mann (with a little help from David Tebbut) could have the answer...

Quick Compilation

The Spectrum user who is keen to try his hand at writing games will soon run into a major problem — Basic is just too slow for satisfactory 'blob-chaser' graphics. One answer, of course, is to program in Forth or machine code; Abersoft has produced an excellent implementation of Forth for the Spectrum (a full review of which will be published in due course), and there are numerous assembler/monitor packages available for machine code programming.

But the beginner is often understandably wary of machine code — to someone who has only recently learnt to program in Basic the collection of mnemonics and hex digits can be somewhat offputting, to say the least. One possible solution is to invest in a compiler — simply load this from tape, key in your lines of Basic, press a couple of keys and presto! your Basic is miraculously transformed into a machine code program that runs many times faster. Or so the theory goes... In practice, however, things are rarely that simple. The advertisements for various Spectrum compilers confidently claim 'Up to 250 times faster! Compiles 95 per cent of Spectrum Basic', etc. etc. and these claims are true enough. But '250 times faster' is under optimum conditions — speed increase in general use is more of the order of 10-100 times faster, and the important point to consider as regards '95 per cent of Spectrum Basic' is the missing five per cent: this includes floating-point arithmetic, string handling and all but the simplest of arrays.

Within these limitations, though, there's no doubt that a compiler is a useful tool that will certainly speed up your programs to a considerable degree — if you accept the fact that you will have to be very careful when writing your Basic to keep within the set limits.

I've had a look at three Spectrum compilers — from Softek, Wye Valley Software and Personal Software Services. Both Softek and PSS promise enhancements to deal with floating-point arithmetic and strings and I will take a more detailed look at Basic compilers when these are available. In the meantime, Softek Super C compiler.

what do you get for your money?

The Softek Super C compiler, although the most expensive, has one major advantage — it is part of a complete system which enables you to define functions and routines that allows you to compile complete programs at a single keypress. However, its methods of dealing with inputs and string arrays are not as straightforward as those of its competitors and it restricts the user to 26 variable names, all in upper case.

Super C does not handle either numeric or string inputs, but these can be simulated for string inputs you have to set up a keyboard scanning routine which puts the ASCII codes of characters into high memory — these characters are then retrieved by the use of PRINT CHR$ PEEK. To deal with numeric inputs, an area of memory is allocated as a buffer to store the ASCII codes for the numerals. A checking routine is necessary to ensure that the code is between 48 and 57 (the digits 0-9), and you also need a counter so that you will...
A major drawback for the Spectrum user is the machine's weedy sound facilities — the BEEP command is limited and the volume pathetic. The Oric's sound capabilities put the Spectrum to shame. A host of hardware add-ons have been produced by various firms to boost the Spectrum's feeble BEEPS. These include devices that route the sound through the TV set and small plug-in amplifiers that double as transistor radios.

Fuller Micro Systems has now come up with what must be the state of the art in Spectrum sound systems. Of modular design, and at its simplest it consists of a straightforward BEEP amplifier. The 'Fuller Box' adds a programmable sound generator, and there is also the 'Fuller Orator' speech synthesis unit. The 'Master Unit' brings all these together in a single box.

The sound generator is based around the 8912 sound chip (as used in the Oric). It has 16 internal registers and is easily programmed via the Basic OUT command. This chip gives enormous flexibility — you have control of three tone channels and a noise channel which can be used on its own or mingled with either or all of the tone channels. There are also 10 'envelope' modes, enabling the shape of the note to be altered — so you can make your Spectrum sound like a guitar, a piano or a machine gun.

Using this unit, very respectable music can be produced, utilising chords and harmony. The impressive demo cassette gives a sample minuet as an idea of what can be achieved with a little effort — but you are really limited only by your imagination. The easiest way to program the sound generator is via a set of DATA statements — each register is accessed by two OUT program lines: OUT 63, n and OUT 95, n. As yet I have investigated only simple tunes and sound effects, but I look forward to many hours of experimentation.

The Fuller Orator also utilises OUT as its means of generating sound; this time OUT 159, n will produce speech. Unlike many cheap speech units that rely on a built-in vocabulary, the Orator uses phonemes and alliphones to build up its own words. You have to get used to thinking phonetically rather than relying on spelling, but it is infinitely flexible and the results are excellent. The voice is unannimously reminiscent of TV's Metal Mickey — indeed my first thought on receiving it was to program it to say 'Hello, my little fruitbat!'. A bit of practice and frequent consultation of the table of alliphones provided will soon have your Spectrum talking to you.

In addition to speech and sound, the Fuller Master Unit has a joystick port (IN 127) which accepts many cheap Atari/Commodore-type joysticks, and a much-improved cassette interface that allows you to save programs without having to remove one of the leads. The whole unit is encased in a black plastic box that matches the Spectrum design and simply slots into the edge connector at the rear of the computer. Other accessories can be added on to the connector at the rear of the unit.

All in all, this is a superbly designed and finished piece of equipment. It enhances the Spectrum's sound capabilities to a surprising degree and is very reasonably priced.

Sound amplifier box £6.95
Fuller Box £29.95
Orator + Box £39.95
Orator upgrade (to fit in Box) £100/24.95
Master Unit £54.95 (Available from Fuller Micro Systems. The ZX Centre, Sweating Street, Liverpool 2.)
work out the starting address for use with USR. Also very handy are the Super C REMs — REM B checks for the BREAK key being pressed; REM M allows you to insert a machine code routine into the Basic you are compiling; and REM N gives a total NEW, with program and compiler being wiped from memory. NEW itself clears the program only and leaves the compiler intact.

The PSS compiler is called M-Coder, and the cassette has versions for both 16k and 48k SPECTRUMS. This review will concentrate on the 48k model and addresses mentioned are for this version.

After loading the correct version for your machine, the Basic to be compiled is typed in or loaded from tape, making sure that the last line to be compiled includes a STOP command. When the program has been entered it should be run to check for errors. Once the Basic is bug-free, RAND USR 60000 will start compilation. Each line is displayed as it is compiled and any errors are met with a flashing cursor and a return to Basic. Successful compilation is indicated by an ‘OK’ message.

M-Coder uses memory more sensibly than does Softek’s compiler — the compiler itself sits at the top of memory and RAMTOP is set initially to 40000. CLEAR n will move RAMTOP, enabling programs to be located anywhere between 24000 and 59000. Thus RAMTOP may initially be set high to enter a routine, then lowered and another entered — so several programs may be ‘stacked’ in memory.

M-Coder has several features to recommend it. One of the most useful is the trace facility — you have the option of disabling the BREAK key except for ‘scroll’ and INPUT (this gives the fastest running code), enabling BREAK (longer code and execution takes twice as long) or setting the trace facility, which results in the line number of disabling the BREAK key being executed being displayed at the top of the screen — very useful for debugging. These options are selected by REM #0, REM #1, and REM #2 respectively.

Variable names may consist of upper and lower case letters plus numbers — so you could have variables a, a, A, and a. Numeric inputs are handled in normal Spectrum fashion, and in general there are less restrictions on the user with M-Coder than with Super C. Arbitrary expressions are accepted quite happily, with the proviso that they are enclosed in brackets in LET statements. GOTOs and GOSUBs will jump to the next line number if the one stipulated does not exist, and PAUSE 0 has its normal effect of stopping program

EASY GRAPHICS

One of the first tools a Spectrum programmer is going to need is a good user-defined graphics designer. There are many such programs on the market — a particularly interesting one is Bridge Software’s Spectrographics system. This is a complete graphics toolkit that aids in the design of hi and lo res screens, enables the user to print characters at up to eight times their normal size and gives easy single-key commands for a variety of graphics applications.

The system is menu-driven, with the menu on screen at all times in the ‘prompt area’ in the bottom two lines. For a sample of the routine’s capabilities, see the accompanying photograph; as a guide to using Spectrographics the list of commands accepted will give some idea. In each case the capital letter is the key you need to press to access the desired command.

cRs: clears the whole screen to the current paper command.

1Oad: three options — load previously saved user-defined characters; load title plus display; load display only.

Colour: the colour menu consists of seven options giving control of foreground and background colours, flash, bright, border, screen (this colours the whole screen according to settings of Paper, Ink, Flash and Bright), and local (colours selected area of screen without affecting the rest).

Save: saves current display on tape.

ChArS: allows definition of graphics characters. Up to eight characters may be defined at once, enabling definition of large shapes.

Text: prints block of characters on screen of height varying from normal to eight times normal size.

Write: Spectrum is used like a typewriter for entering text.

Lo-res: This allows you to draw on screen using a special cursor block set up on keys G, Y, U, I, K, M, N, B.

Hi-res: As lo-res, but using high resolution graphics. Includes routines to design boxes, triangles, circles and fill them in with solid colour.

Title: sets up title for display — this is printed on bottom two lines, leaving whole screen for the Basic screen.

Paint: causes current screen to be printed on ZX printer.

Grid: Alternate character squares on the screen are set Bright — useful for maps or complicated drawing. When G is pressed for a second time, grid is erased without disturbing picture.

With the help of this pack-
execution until a key is pressed. However, M-Coder cannot handle a STEP in a FOR/NEXT loop. A major advantage is M-Coder's ability to handle arrays, albeit in limited form—a separate array of numbers can be set up with the familiar DIM Z(x) command. All elements are initially set to zero. The array handles numbers only and it must be called A instead; however it is certainly easier to handle than the convoluted array simulation of Super C.

The third in our trio of Spectrum compilers comes from Wye Valley Software. Initially this was a pre-production copy, and the only documentation supplied consisted of a few handwritten pieces of paper. But, for ease of use, I would rate this one the best. Compilation procedures are the same for the other two and, with M-Coder, the compiler is suitable for both sizes of machine—here I will concentrate on the 48k version.

After typing in your program and entering RAND USR 60000 you are met with a very clear screen display. 'START ADDRESS' gives, funnily enough, the start address of the program being compiled (one byte above RAMTOP), which is set initially to 40000. 'END ADDRESS' is updated during compilation and gives the last address of the compiled code. 'ARRAY END ADDRESS' appears only when the program makes use of the array A that Wye Valley compiler has provision for. If a numeric array is used, this time it must be called 'A' and can be up to 255 elements in length. Successful compilation is heralded by 'NO ERRORS', while if at any stage 'ERROR' appears on the screen the compiler has found a line it can't handle—in which case the offending line is printed out with '?' after the mistake.

To run a compiled program, simply note the start address, then type 'RAND USR start address'. Programs may be stacked by moving RAMTOP. The range of command handled is very similar to that of M-Coder. Calculations must be enclosed in brackets, STEPs are dealt with in normal Basic manner, and GOTO/GOSUB/RESTORE follow usual Basic style. Numeric inputs are totally straightforward and have the advantage of optionally appearing in the top portion of the screen.

Where the Wye Valley compiler compiler really scores, though, is in its range of additional commands. These are accessed via REM statements and are summarised as follows:

- REM A.e — sets colour attributes to value e
- REM B — checks to see if BREAK is present
- REM F — sets whole screen to current attribute without clearing display
- REM L.e — scrolls line e left one pixel
- REM R.e — scrolls line e right one pixel
- REM N — outputs random noise in the form of an explosion
- REM S.e,x,y — 'mini'sprite' graphics. Puts character ASCII code e at plot coordinates x,y

These special functions give the Wye Valley compiler the edge over its competitors and, at £7.99, it is only slightly over half as expensive as Softex's Super C. It would certainly be a good investment for the Spectrum owner who wants some of the benefits of machine code without having to learn its idiosyncrasies. Super C — Softex, 329 Croxton Road, London SE24. £14.95.

M-Coder — Personal Software Services, 452 Stoney Stanton Road, Coventry CV6 5DG. £8.95. Wye Valley — Martin Lewis, Forton House, Kinnersley, Hereford. £7.99.

The only other commands are introduced to the various commands in MCTT by way of specific examples. The examples show you how to load and add registers, how to compare and branch, how to call subroutines and return and how to load memory from a register—all you really need to know in order to get cracking with machine code programming, in fact. The MCTT commands thus introduced are Alter (A), Breakpoint (B), Go (G) and Register Display (R). Not surprisingly, Alter allows you to change memory contents, Breakpoint lets you stop execution at a particular point so you can see what happened, Go starts program execution at a particular point and Register Display shows the current state of the various registers.

The only other commands are Move (M), which lets you shift blocks of memory around; Page Memory (P), which shows you any contiguous 30 bytes of memory; Memory Dump (D), which 'undoes' the last breakpoint and Stop (S), which returns you to Basic.

Everything worked well and during the test, I didn't crash it once. The commands are easy to use and the booklet is very clear. It does contain a couple of small errors but, unless you're a complete nerd, they are pretty obvious and shouldn't hold you up. I figured that a price between five and ten pounds would be appropriate. I then learned that it had been pitched at £9.95. I suppose that when you consider the 'free' character generator, this represents fair value for money. MCTT runs on both 16k and 48k Spectrums and is obtainable from Oxford Computer Publishing Ltd or larger branches of W H Smith.

David Tebbutt
The following article describes a complete Lisp program that illustrates, in an entertaining way, how a computer can be made to appear intelligent by the application of a few simple rules. The program, called Eliza, plays the role of psychoanalyst to a human patient, and gives rise to the following type of dialogue (the human’s input is in bold):

**How do you do. Please tell me your problem**

**My relations are all alike**

**In what way?**

They’re always getting at me about something or other

**What incident are you thinking of?**

Well, my mother made me come here

**Who else in your family made you come here?**

No one

**Tell me more about your mother**

She treats me like a child

**What exactly do you mean?**

There’s nothing to worry about when Eliza is there to share your problems. David Johnson-Davies lies back and reveals all...

However, the real power of MATCH is its ability to cope with more sophisticated rules for matching, and these are implemented by means of special symbols, such as ‘*’, ‘-’, ‘?’ and ‘@’, which can occur in the pattern list:

- matches any sequence of words, and
- matches any sequence of words and assigns the matching list to Q (or any other symbol).

Thus: (MATCH '(ONE STAR TWO)' (ONE THREE FOUR TWO)) = T

The simplest facility MATCH provides is to test two sentences to see if they are the same, for example:

\[(\text{MATCH} \ '(\text{ONE TWO})' \ '(\text{ONE TWO})) = T\]

\[(\text{MATCH} \ '(\text{ONE TWO})' \ '(\text{ONE THREE})) = \text{NIL}\]

```
(defun match (d f)
  (cond
    ((null d) (null f))
    ((equal (car d) (car f)) (match (cdr d) (cdr f)))
    ((null d) (null f))
    ((null f) (null d))
    (t (match f d)))
```

Fig 1

(DEFUN GETQ ((L) (Q) (Q) (Q) )
  (COND
    ((null L) (null Q))
    (T (CONS (CAR L) (GETQ (CDR L) Q) ))
  ) )

```
(defun append (head tail)
  (cond
    ((null head) tail)
    (T (CONS (CAR head) (append (CDR head) tail))))
```

Fig 2

The full definition of MATCH is shown in Fig 1. It is a function of two arguments, P the pattern, and D the data. Its operation is as follows: First, a null pattern always matches null data. Otherwise, set the local variable CP to the first item in the pattern and test for other possibilities. If there is no...
more data (NULL D), only match it if the pattern is * or, or "=" followed by a variable. If the first item of the pattern is @, replace it by the next item’s value. If the first item of the pattern is the same as the first item of the data, or a "=", they match, so call MATCH recursively for the remainder of the pattern. If the pattern begins with "*" it matches anything. Finally, if the pattern begins with "=", it matches anything, and assigns the matching words to the following variable.

The MATCH function can be used in a wide variety of applications relying on the manipulation of sentences, such as "intelligent" interfaces to problem-solving programs, or adventure-type games.

Next, Fig 2 shows the function that reads the user’s input; GETSEN. It reads in a sequence of words, up to a RETURN, and makes then into a list: for example:

(DEFUN GETSEN NIL)

THIS IS A SENTENCE
will return (THIS IS A SENTENCE).

This function uses APPEND which, if not already present, can be defined as shown in Fig 3.

Next, Fig 4 shows a function PRL which will print a list of words with all brackets removed, inserting a new line if the sentence will not fit neatly on the screen. Thus:

(PRL 'THIS (IS) ((A)) SENTENCE)
prints THIS IS A SENTENCE

In addition, the following special symbols may be used in PRL:

= Q prints the value of Q
£ Q prints the value of Q, and sets Q to NIL.

Thus, (SETQ Q ’(NEW LONGER))
(PRL ’(THIS IS A £ Q SENTENCE))
prints THIS IS A NEW SENTENCE and sets Q to NIL.

This last facility is used to make Eliza hark back to an earlier topic by printing a sentence containing a keyword that has already been matched. The keyword is set to NIL to record that it has been used.

Database format

The Eliza program is driven by a database of keywords, and patterns. The keywords are recognised by the Eliza program in the sentence that the user types in. For each keyword in the database the following information is stored:

1. A replacement for the word if it needs to be exchanged.
2. A value giving the significance of that word.
3. A list of patterns to be tried against the sentence containing that word, with the corresponding replies.

Thus, the entry for AM in the database is:

(SETQ AM
t(‘ARE YOU = R)
(‘DO YOU BELIEVE YOU ARE = R)
(‘I DON’T UNDERSTAND THAT))

This specifies that each occurrence of AM in the sentence typed in should be replaced by ARE, and that the value of AM is O. Finally, if AM is selected as the highest-value word in the sentence, an attempt will be made to match the two pattern strings. Thus if the sentence were:

AM I GOING MAD
this would first be converted into

ARE YOU GOING MAD
(because each occurrence of I is also converted into YOU), and this would then match the first pattern:

(‘ARE YOU = R)
giving the value (GOING MAD) to R, and the reply:

DO YOU BELIEVE YOU ARE GOING MAD
would be given. The second pattern (‘*)
will match any input sentence and result in the catch-all reply ‘I DON’T UNDERSTAND THAT’. Thus, the Eliza program is to perform the following steps:

1. Look up all the words in the sentence typed in by the user. Keep a record of the word with the highest value, and the corresponding list of patterns for that word.
2. Replace all those words for which a substitute is supplied.
3. Try the patterns one by one on the input sentence and return the match string for the first one that matches.

The first operation is performed by the function LOOKUP, shown in Fig 5. It looks up each word in the input sentence, and, if found in the database, it calls another function, FIND.

FIND, shown in Fig 6, takes the database entry of a word and tests its value against a list called RMAX, which contains the value of the best word so far found. If greater than MAX, RMAX is set to the list of patterns and matches for that word.

If no match is found, the function FLANNEL is called which gives a non-committal reply, or harks back to a subject mentioned at an earlier time; see Fig 7.

Calling FLANNEL more than five times terminates the interview with the message ‘SORRY YOUR TIME IS UP!’. The global variables/FAMILY, /MEMORY, etc.,
The Eliza database

Finally, the most important part of the Eliza system is the database, which determines the replies it will give in different situations. The following definitions illustrate one possible set of rules and patterns that can be used for the Eliza program, the possibilities are unlimited, and with some ingenuity there is probably much scope for improvement.

First a function DEF is defined, such that (DEF A B) is equivalent to (SETQ A 'B):

(DEFUN DEF X (SET (CARX) (CADR

Entries in the database have three formats:

1. (DEF A B) gives B as the word to replace every occurrence of A.
2. (DEF A (B N (P1 M1) (P2 M2),...)) gives for word A the replacement word B, value N, and the patterns and matches P1 M1, P2 M2, etc. B can be omitted if no replacement is required.
3. (SETQ A AA) makes A behave in exactly the same way as word AA.

The database is shown in Fig 9, and the keyword definitions are not in any particular order.

Postscripts

There are several possible ways of improving the realism of Eliza's responses. One serious drawback is that the program will usually give the same reply if given the same sentence twice. In Weisenbaum's original program this was avoided by marking each pattern every time it was used; a marked pattern would only be used again if no other possible match was found. A second simplification present in this version of Eliza is that once the highest-valued keyword has been chosen, only patterns supplied under that keyword are matched against the input sentence. If none of these matches, all attempts are abandoned and a call to FLANNEL is made; a better approach might be to try another keyword.

Finally, a more adventurous project might be to make Eliza learn from its encounters with humans, so that the database of keywords would be expanded as more people used it.
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ACORNSOFT
Tomorrow’s Office is a data management package especially supplied for the Sirius: it uses the capabilities of the screen to show an attractive face to the user, and it uses the function keys to make the package easier to use. The approach is clear from the beginning — a picture of the ‘Welcome’ screen is shown as Fig 1. The functions it provides cover pretty well the full range I’ve come to expect in fully-fledged micro data management packages for 280 and 8086/80-base machines. The package runs under MS-DOS. It allows the user to set up a master file for a particular application, and a related transaction file, with the same key but with perhaps many transactions for each master record. For many applications, only a master file would be required. But for some people, the master/transaction approach could be very useful; for instance, a doctor could keep the overall information about patients, such as date of birth, NHS number, address, etc on the master file, and then keep one transaction record for each separate illness suffered by the patient. Throughout, you can usually assume that similar facilities are provided for master and for transaction records, though there are some limitations; for instance, you can’t create a transaction record for which no master record exists.

Tomorrow’s Office is used initially through the menus provided, which lead to sub-menus of individual commands such as Record Insert, Record View, etc, but as the user becomes more experienced he or she can invoke these commands directly using two-letter codes. For a particular application, ‘tailored’ menus can be provided, and sets of commands can be stored in a file for subsequent execution. The main menu is shown as Fig 2 and the expansion of this, giving a full list of the commands in each section, is shown as Fig 3.

### Constraints

The limitations on file and record sizes are shown in Fig 4. The master record size is quite small — it should be sufficient for most applications which consist entirely of coded information plus text with limited length such as name and addresses, but would be inadequate for applications with a major element of unstructured text — even designers of library catalogues would have to watch out. However, where the information could sensibly be segmented into a master/transaction format, the ability to associate many transactions with a single master record has the effect of giving a virtually unlimited capacity for expansion. The other major limitation to note is the emphasis on key-field retrieval — I’ll say more about that later.

Tomorrow’s Office is a large package; it needs one complete Sirius single-sided disk for the main parts of the program and for the control files associated with applications. Two more disks are used for other, less frequently-used programs, and the user is prompted to change disks whenever necessary. (The total file space occupied by the package is a little over 1.5 megabytes.) The manual recommends having one ‘master’ disk for each application, to avoid any danger of running out of space for control files. The presence on the master disk of control files means that as well as making back-up copies of the data files each time they are changed, you must also make copies of the control files. The disk format is special to the package; a Tomorrow’s Office disk can only be used for Tomorrow’s Office files. This factor, combined with the profligacy of the system in other areas with regard to disks, could mean an unusually large investment in disks. It could also be awkward if you are switching between the package and, say, Wordstar — though a regular user of Tomorrow’s Office has to become inured to frequent disk changing.

### File creation and indexing

To create a data file, you must first set up a master format of the data. This is kept in a separate file. The process of setting up a format is a combination of ‘paint-a-screen’ and response to prompts. For each field in the record, you position the cursor at the position where you want the field title to begin, press the ESCape key, and then reply to the prompts in the bottom part of the screen about content of title, type and length of field, and so on. (You can choose to define start of field position by row and column numbers instead, if you really want to.) Fields may not span more than one line, but the associated title can be on the line above, to permit titles for maximum-length fields. Fields can be defined as depending on the values of other fields, to be replaced by the result of the calculation at input or amendment of the record, but the exact definition of the calculations is given
separately — see my section on 'Calculation'.
Where a transaction file is associated with
the master file, you must allow sufficient
space below the master format to display
the transaction format simultaneously.
Once created, you can ask for a print of the
format in a form which gives lengths of
fields and other useful information — the
printout for my Benchtest records is shown
in Fig 5.
I have mixed feelings about the use of
'question-and-answer' for defining a format
personally, I think it's easier to have a
completely 'paint-a-screen' approach, with
'help' information on the bottom of the
screen, so that you can see immediately the
effect of what you're doing. But the formatting
was quite easy and flexible to use, so
it's not a serious disadvantage. One feature
I particularly liked was the ease with which
one could say 'I'd like another field just like
this one' in a particular position (marked
with ESC as usual), and then change just
the title of the new field, rather than having
to define separately several fields with
identical formats.
Each field must have a single alphanumeric
key field, which may be defined as contain-
ing unique values or permit duplicates. If
the key field must be unique, Tomorrow's
Office will reject records with keys which
duplicate an existing key. This main key is
used for all access for file maintenance —
insertion, amendment, deletion. Indexes may
be created based upon the values of other
fields; these indexes can then be used to
display or print records in a particular
order. You can also select records according
to specified criteria without re-ordering
them in any particular way — see under
'Selection'. But the accent in the package is
clearly on accessing individual records
quickly by using the key field.
In addition to the master format, each file
may also have up to 15 alternate formats.
These are created in a similar way, but can
be used only to display individual records,
not amend or delete them. So if you wanted
to keep some information confidential, but
permit general access to other information
say a distribution list of clerical staff — you
could update public information such as addresses,
you would have to divide the record into a
master and a transaction part, with one
record. You can also select records according
to defined separate several fields with
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not amend or delete them. So if you wanted
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permit general access to other information
say a distribution list of clerical staff — you
could update public information such as addresses,
you would have to divide the record into a
master and a transaction part, with one
transaction per master, and permit general access
only to the transaction part.

**Data input and amendment**

Records are added through the Record
Insert function. The function prompts for
the key value (which for keys longer than
eight characters may be abbreviated to
eight), and then displays a formatted screen
on which the information will be shown.
The package prompts for the value of each
field in turn; the value is typed in at the
bottom of the screen, validated or trans-
formed by calculation if appropriate, and
then displayed in the appropriate field in
the screen display. Thus you do not lose the
facility of moving the cursor around in the
display area to enter or amend information.
If you decide that an earlier field is
incorrect, you must 'cycle' through each
field in turn, typing one character and
pressing RETURN, until the prompt area
displays the name of the field you wish to
amend. A similar process is used for Record
Amendment, with a few refinements. The
method of entering data away from the
display screen format means that correcting
data involves re-entering the whole field —
you can't just change what's wrong. But
you can amend information to existing
character fields. You can also decide 'on
the fly' to have a field take the same value
as the corresponding field in the previous
record.
Record retrieval by exact key match is
reasonably fast — just under three
seconds on my 1000-record Benchtest file. The
commands for insertion, deletion, amend-
ment and viewing of individual records,
retrieved by main key, although separate
commands, can also be invoked from each
other without having to return to the main
menu. So you can retrieve a record for
inspection, decide that unexpectedly it has an
error, 'toggle' to Record Amendment, and
correct the error. The choice process is
quite carefully designed; you continue in
Record Insert or View or whatever mode
you started in until function key 7, the
universal exit key, is pressed. You then
have the choice of removing any of the
transactions, or carrying out any other operations or returning to the one you
first thought of. Fig 6 shows the display at
the point where you are invited to choose
your next record 'housekeeping' function.

You will see that the options include 'print',
you can also take a direct 'snapshot' of the
screen while the data is being displayed by
pressing function key 4.
In addition to the interactive entry of
data, there is a batch input and deletion
facility, which allows you to create a set of
records separately from the main file and
then add them in a batch. This approach
makes faults less likely; firstly, because you
can then have an 'audit trail' printing of the
records before insertion, and also, because
the master file is only open for writing (the
state in which it is most likely to suffer from
corruption caused by power-line glitches,
humans removing disks, etc) for the minimum
amount of time. Some batch updating of
individual records (as distinct from updating
the file by adding records) is also provided.
This includes a feature to add a complete
new transaction record automatically for
every master record — for instance, in an
application where it is necessary to record
regular payments from clients, as in tele-
vision rental, hire purchase or the collection of
insurance premiums.

**Screen display**

In addition to the retrieval of records by
exact matching of the key field, you can
display records in two other ways. Tomorrow's
Office allows the creation of up to 15
alternate formats for a file in order to permit
different screen formats. They can only be

<table>
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<th>FLD</th>
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<th>COL</th>
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<td>57</td>
<td>Alpha</td>
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</table>

You can see the options include 'print',
you can also take a direct 'snapshot' of the
screen while the data is being displayed by
pressing function key 4.
In addition to the interactive entry of
data, there is a batch input and deletion
facility, which allows you to create a set of
records separately from the main file and
then add them in a batch. This approach
makes faults less likely; firstly, because you
can then have an 'audit trail' printing of the
records before insertion, and also, because
the master file is only open for writing (the
state in which it is most likely to suffer from
corruption caused by power-line glitches,
humans removing disks, etc) for the minimum
amount of time. Some batch updating of
individual records (as distinct from updating
the file by adding records) is also provided.
This includes a feature to add a complete
new transaction record automatically for
every master record — for instance, in an
application where it is necessary to record
regular payments from clients, as in tele-
vision rental, hire purchase or the collection of
insurance premiums.

**Screen display**

In addition to the retrieval of records by
exact matching of the key field, you can
display records in two other ways. Tomorrow's
Office allows the creation of up to 15
alternate formats for a file in order to permit
different screen formats. They can only be
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used via the Select File function, which has two drawbacks. Firstly, data can be viewed with the alternate formats but not amended. Secondly, and probably much more of a nuisance, before using an alternate format you must set up a Selection Criteria file to choose which record to display, even if you want to show every record in the file. This is not a lengthy process, but it is irritating to have to do it — and since the alternate formats are like the ‘snapshot’, as you can with Record View, etc., you must decide in advance if you want to have printed information about a particular group of records. Nor can you opt to start at a particular point in the file — scrolling just begins at the beginning.

**Printed reports**

Tomorrow’s Office provides, in addition to the ‘screen snapshot’ key and the functions for printing individual records or simple lists of records, two functions specifically for printing formatted reports. One caters specifically for label printing, while the other provides a more general report format. Within a report, extra fields may be used to calculate results depending on a series of arithmetic operations; you may also request the creation of an index, a term which the package uses to mean both a list of pointers to records ordered in some other way than by primary key, and a set of pointers to a subset of the whole file of records. (Indeed, the option for sorting is provided for one master record and any number of sub-records.) Once created, sets of search criteria can be edited, or they can be used as the basis of new selections.

**Selection**

Two kinds of selection are provided: a simple search which is typed in and executed entirely interactively, and a more sophisticated search in which a set of criteria is stored in a file and subsequently used to access a subset of the data. The simple search allows you to specify up to four criteria; you can allow selection on any of the criteria, or you can say that several must be present — for instance, with three criteria, you can ask for at least two (if any) to be present for the record to be selected. The comparisons allowed include less than, greater than, equal to, and a ‘wild code’ search in any field in the file. For character data, you can choose to have the case of the letters ignored when making comparisons.

Stored criteria may be linked by AND, OR or NOT; the tests are carried out sequentially, and you can’t use brackets to alter the order of evaluation, so there are some circumstances in which you might need to carry out successive selections to get the desired result. Comparisons allowed are much more extensive than in the simple search, and include all those permitted there plus testing for characters being contained in a specified range or containing a character field, not equal to, and a limited ‘wild code’ facility. Searches may be carried out on the whole data file (ordered by primary key or by an index), or on subsets created by previous runs of the selection function. Once created, sets of search criteria can be edited, or they can be used as the basis of new selections.

**Sorting**

Records in Tomorrow’s Office files are not physically sorted; instead, you request the creation of an index, a term which the package uses to mean both a list of pointers to records ordered in some other way than by primary key, and a set of pointers to a subset of the whole file of records. (Indeed, the option for sorting is actually called Extract and Sort.) Ordering of records may be by up to three complete fields — you can’t concatenate fields to increase the depth of sorting, nor can you utilise your knowledge of the data to ask for sorting on only part of the field. Sorting is very quick (see Fig 8 for the Benchtest), but it needs to be, for several reasons. In particular, the indexes are not kept up-to-date when data is amended, so the file must be re-indexed each time changes are made which could affect the ordering or subsetting.

In addition, because of the limitations on Index View/Print, which I mentioned under Screen Display, you could well need to create a subset-index quite frequently, if you wanted to print subset information in a condensed format, without going to the bother of generating a full report.

**Calculation**

Calculations can be carried out on fields within individual records, or on aggregations of records. Fields can take a calculated value when inserted or amended (this must be defined in the master format), or on update; in either of these circumstances the calculated value is placed in the appropriate field in the file. This makes it possible to increase all current prices by ten per cent or work out the store the total value of an invoice from the value of the individual items and the VAT rate. Calculations can also be carried out when reports are printed. Arithmetic operations provided are the usual add, subtract, multiply, divide and some commercially useful functions such as per cent. You can operate on constants, field values, or a worked area — two numbers can be provided and displayed on the screen as part of the automatic update feature, and totals and sub-totals provided during the printing of reports.

**Multiple files**

Tomorrow’s Office has good facilities for handling records of the master/slave type, providing for one master record and any

---

**Fig 8 Benchmark Times**

| BM1 | Time to add 1 new field to each of 1000 records | 40 mins |
| BM2 | Time to add 50 records interactively | 1 sec/record |
| BM3 | Time to add 50 records ‘in a batch’ | NT |
| BM4 | Time to access 50 records from 1000 sequentially on 25-character field: with simple search | 5 mins* |
| BM5 | Time to access 50 records from 1000 by index on 25-character field with stored search criteria | 3 mins* + set-up time |
| BM6 | Time to index 1000 records on 25-character field | BM6 + 1 sec + scrolling |
| BM7 | Time to sort 1000 records on 5-character field | 4 mins 23 secs |
| BM8 | Time to calculate on 1 field per record and store result in record | 8 mins |
| BM9 | Time to total 3 fields over 1000 records | 5 mins 20 secs |
| BM10 | Time to import a file of 1000 records | 1 hour 34 mins |

Notes: * includes scrolling  NT Not Tested
TOMORROW'S OFFICE

number of linked transaction records. No generalised multiple-file capabilities exist at the moment, although I understand that such a development is being considered.

Tailoring

Tomorrow's Office provides two sets of facilities to 'tune' the system to a particular application. Firstly, you can set up command files which string together a series of keyboard commands for subsequent execution. These command files are set up by means of a 'learn' mode, in which the command sequence is typed in from the keyboard. Secondly, user menus can be set up so that people get a particular view of Tomorrow's Office according to their own needs; these menus can include direct access to the package's commands, or access only to tailored command files, or a combination of the two. No extra facilities are needed to allow for conditional execution in command files; the only conditional facilities pertain to the selection of records for processing by the Select File function. So if you wanted to process a record in one way if it had certain characteristics, and in a different way if it did not, you would have to set up two subset-indexes, one for each group of records, and process each subset separately. This would involve two complete reads of the data file, and therefore would tend to be slower than selecting and processing in one go.

Security and reliability

Tomorrow's Office has some plus and some minus points in this area. The ability to store an audit trail and add data in a batch could provide good safeguards against several types of failure; but the need to copy files on two disks after every change to the system makes it even more likely that people will fail to take the elementary precautions to keep their information safe. As to failures in the package itself, the only bug I encountered involved receiving a program error message rather than a meaningful error report when I tried to sort, using a full disk to store the index files. (But I did get returned to the menu afterwards.) For a package of the complexity and extent of Tomorrow's Office, one non-serious bug in a Benchtest is (relatively) pretty good. (One ought to be able to assume that none would be the norm, but it isn't — I very rarely suffer disasters, but I often encounter more bugs than one.)

Housekeeping

Almost all housekeeping is done within Tomorrow's Office, with the exception of disk functions such as formatting, which are carried out under a specially modified version of MS-DOS in order for the package to stay in control. The only thing I couldn't do with the copy of MS-DOS provided was to copy an index file (created during sorting) from a work disk to the main program disk. It didn't matter too much, as I was always prompted for the loading of the work disk whenever an index was needed, but it was irritating enough for me to get out our own MS-DOS and copy the file outside Tomorrow's Office.

Links with outside

Tomorrow's Office can read sequential files containing ASCII characters in a predefined format (with each field followed by a Carriage Return character), into a Tomorrow's Office format set up with Create Format. I had no problems in creating such a file from Basic, for the Benchtests. To tell Tomorrow's Office how to assign fields in the 'stranger' file, the package gives you a list of the numbers of all the fields in the target Tomorrow's Office file, and asks for the corresponding field numbers in the source data file. Unfortunately, there is no default; even if you have the same number of fields in the same sequence in each file, you still have to enter as many field numbers as there are fields in the target file. However, it's not an operation you carry out very often, and the actual conversion worked correctly first time — and that certainly doesn't happen with every package I review.

Tomorrow's Office data files can be written out in a similar, though more flexible, format with any field terminator including Carriage Return. It is thus possible to create a data file for use with Wordstar Mail-Merge. (Tomorrow's Office, despite its name, doesn't have any word processing facilities beyond report tables.) However, I couldn't find a way to have any kind of record terminator, so you couldn't write, say, a file with comma-delimited field and CR-delimited records, such as some people might need. Again, the ability to get out at all is invaluable, and it would be a simple job to transform the output to other formats by a user-written program if required.

User image: software

Full marks to Tomorrow's Office for helpful use of the combination of menus and commands — very much the kind of approach which is likely to help the most people for the most time. The overall design of the menus, commands and 'bottom-line' prompting was clear and consistent, so you could get to grips with the package very quickly. That's very important in a package with many facilities with which you might not be used were well, too — a plus point, but with reservation. They did, however, give me my first big disappointment. I thought it an excellent idea to be able to use a function key to 'dump' the contents of the screen to the printer whenever the package is awaiting input from the keyboard; but unfortunately 'awaiting input' didn't include 'awaiting ESC when display is halted for the user to inspect the screen'. That was a real shame, as that was just when I most wanted the screen dump.

That combination — good points with minus points.

Summary

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<tr>
<th>Package Type</th>
<th>Data management: single file or master file with associated transaction file.</th>
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</thead>
<tbody>
<tr>
<td>Facilities</td>
<td>Selection, ordering by indexes (not kept up-to-date automatically), calculation in and across records, updating on primary key, good reporting, import and export of files.</td>
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<tr>
<td>Ease of Use</td>
<td>Very good, with a few small exceptions.</td>
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<tr>
<td>Error Messages</td>
<td>Clear and immediate.</td>
</tr>
<tr>
<td>Documentation</td>
<td>Clear and thorough — but no index to Reference Manual; good Training Guide.</td>
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<tr>
<td>Costs</td>
<td>$295 including software updates during the lifetime of the package and 'hot-line' telephone support.</td>
</tr>
<tr>
<td>Supplier</td>
<td>Stage One Software, Poole, Dorset. Tel (0202) 735656</td>
</tr>
</tbody>
</table>
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Logitek. Logitek House, Bradley Lane, Standish, Greater Manchester, WN6 OXQ Tel. 0257 426644
Logitek, London 30 Brook Mews North, London W2 3BW Tel. 01-723 0012
The MB16001 — to be launched here in July — boasts complete compatibility with non-graphic software for the IBM. With this advantage its sales success seems guaranteed. Steve Withers benchtested the machine in the Antipodes and reports back to us on his findings.

8088 based systems are rapidly becoming as commonplace as Z80 micros, and, in the same way that one CP/M machine tends to be much like another, these larger computers running MS-DOS have much in common. They naturally share many pieces of software, offer similar expansion options, and many of them are manufactured by companies with established reputations in either the computer or consumer electronics fields.

Hitachi has been in the 'IBM-compatible' business for some time, and the MB16001 follows this tradition, having a high degree of hardware and software compatibility with the long-awaited IBM Personal Computer.

Hardware

Cosmetically, the MB16001 is not the most attractive computer, but it does have its good points. The main unit is 30 cm high, 49 cm wide, 25 cm deep and has a bulky appearance. The shortest dimension is the depth, so it is not possible to place the display on top in order to save desk space. The document holder on the front of the unit is a good idea, as it saves the user having to keep looking down to the desk in order to read a manuscript or other source document, but its usefulness obviously depends on the position of the computer on the desk, and I think it spoils the lines of the system.

The only controls on the main unit are the power switch and the volume knob for the
The keyboard is not as pleasant to use as it is to look at.

Sound generator, so it is possible to save space by standing the machine on end beneath the desk with the disk drives at the top. The keyboard and monitor share the main unit's pleasant brown and off-white colour scheme and overall styling, but I think they are much better looking.

On the subject of appearance, something I really like about the MB16001 was the way all the connectors (apart from the one for the keyboard) are recessed into the case, with a snap-on cover keeping everything tidy. Any connectors on accessory cards come out in this area, and the compartment also houses the batteries which back up the system clock.

Software and hardware switches control various system options and parameters, such as the number and type of disks in the system. The software settings are held in battery-backed RAM, and the physical switches inside the machine only take effect when the batteries (three size AA cells) are flat or are removed. Normally the DIP switches would be set before delivery or after extra cards are installed, so a typical user would never be concerned with them.

There are two main circuit boards, each a little larger than an A4 page, mounted behind and parallel with the document holder. I was unable to take a good look at either of them without dismantling the machine further than I cared to, but one seems to be the computer itself (with edge connectors for expansion boards) while I suspect the other is the display generator.

Hi-tech controls.

For servicing, two screws at the back secure the cover of the expansion area, while another two hold the rest of the shell in place. The snags are that the accessory cards must be removed (this involves undoing various screws and brackets) before either of the main boards can be extracted, and there are a large number of connectors between the various modules. Hitachi does not seem to have gone out of its way to make life easy for service engineers or, in addition to these problems, very few chips are socketed. Perhaps the company feels its product is so reliable that there is no need to worry about such things.

The MB16001 will plug straight into a 240 volt mains supply. It will function at 50Hz and conform to British electrical standards. A quiet-running fan helps to keep the power supply and other components cool.

Unfortunately, the keyboard is not as pleasant to use as it is to look at. Although feedback is provided by an inbuilt electronic clicker as well as an increase in key resistance, I had an unusual amount of trouble with missed keystrokes. While this was partially due to my over-compensation for the lightness of the key action, the MB16001 just does not have the 'feel' of a good typewriter keyboard. The main part of the keyboard is conventionally arranged, with the addition of 'ALT' (for quick entry of Basic keywords) at the bottom right. It has been customised for the UK with the inclusion of both '@' and '$' signs. Along the top of the board is a row of 10 function keys, plus a 'CANCEL' key (which generates Control-C and is protected from accidental depression by a clear plastic surround). Cursor, insert, and delete keys are grouped together, and beneath them is a number pad which can also provide extended cursor control (another example of the MB16001's compatibility with the IBM). Other keys in this area are 'HELP' and 'MODE' (neither of which are recognised by the standard software), 'COPY' (to dump text and/or graphics to the printer), and 'GRAPH' (a super-shift key to obtain graphics characters).

The reset button is mounted on the rear edge of the keyboard, with adequate protection in the form of a raised legend. A generous length of coiled cable and a DIN plug connects keyboard and computer; the computer's socket being below and slightly to the left of the second disk drive. The length of the cable makes it feasible to work with the keyboard on your lap, but when working on a desk two small legs unfold to
give a conventional slope to the keys.

Turning to the display, the monitor itself seems slightly deeper than normal, but I think the designer expected a whole desk to be devoted to the machine, so saving a few centimetres here and there would not have made much difference. There are three controls: power, brightness and contrast. The last two are normally flush with the facia panel, but they pop out when pressed. The angle of the screen can be altered by releasing a catch on the pedestal, but the range of adjustment is not very great. A monochrome monitor may be used if colour is not required but monochrome will not be available from Hitachi in the UK. This marketing approach differentiates the MB16001 from the IBM Personal Computer — for the latter a colour monitor is an optional extra at a price (£550 for the terminal and £216 for the adaptor).

The text and graphics displays are independent of each other, and either or both may be shown on the physical screen. This could be useful when debugging a graphics program, as the program can be listed and edited without disturbing the graphics — the text simply scrolls over the top. Interlacing is an optional feature of the text display (I found it made the text more legible at greater than normal viewing distances) and it is necessarily used for the highest resolution graphics. The character set has a number of graphic symbols including some which would allow the drawing of boxes for data entry forms.

Both text and graphics come in the usual eight colours, and a bright version of each (brightening black does not make much difference!) brings the total to 15. The programmer may choose from four graphics resolutions (320x200, 320x400, 640x200, or 640x400), with any eight of the 15 colours appearing at once, seen at the highest resolution. All 15 colours can be used for text, with either 40 or 80 characters per line. Multiple pages of display memory add to the MB16001's potential: four pages of low-res graphics may be used, reducing to one in the full 640x400 resolution; and either 16 pages of 80 column text or 32 of 40 columns are available.

The quality of the display in all modes is equal to anything I have seen elsewhere, although the highest resolution graphics did

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**Basic Keywords**

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<th>Keywords</th>
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<td>A smooth switch</td>
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<td>GET (graphics)</td>
<td>A smooth switch</td>
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</tr>
<tr>
<td>GOTO</td>
<td></td>
</tr>
<tr>
<td>IF THEN ELSE</td>
<td></td>
</tr>
<tr>
<td>IF GOTO ELSE</td>
<td></td>
</tr>
<tr>
<td>INPUT</td>
<td></td>
</tr>
<tr>
<td>INPUT*</td>
<td></td>
</tr>
</tbody>
</table>
seem to flicker very slightly. This is also the case with the black and white high-res graphics on the Panasonic JB3000. Indeed, apart from appearance, these two computers have much in common with each other and with the IBM PC but, when making comparisons, remember that the MB16001 includes Centronics-style parallel and RS-232 serial interfaces as standard, as well as colour graphics and the light pen interface. If memory size is important to you, note also that the display memory (all 192k or it) consumes no user RAM: 64k is dedicated to each of the red, green and blue colour guns respectively. Apart from the requirements of MS-DOS, all of the standard 128k is there for you to do what you will.

**Software**

MS-DOS and Microsoft Basic are both included in the price of the MB16001. Enough has been written about MS-DOS in these pages, so I will only cover the unusual features. To start with (literally), the boot-up routine has been modified so that it reads the time and date from the system clock, and only asks the user for this information if the clock is unreadable, typically because the batteries have run down.

The other main addition is a utility which sets the various system parameters stored in non-volatile memory. The options given by this program hint at expansion items that may appear in the future. It allows the selection of:

- memory size from 64 to 1170k;
- up to four 5½ or 8 inch disk drives;
- default settings for up to four RS-232 interfaces;
- the default display modes; and
- a RAM disk.

'A RAM disk?' you ask: yes, the operating system includes this feature — a simulated disk drive in main memory which is very much faster than a floppy. The idea is that you copy frequently used data or programs into the RAM disk and use them from there, copying back onto a real disk at the end of a session if necessary. This is potentially most useful for programs with overlays or for database-type applications, both of which repeatedly access disk files. If you use the MB16001's RAM disk, it occupies the top section of user RAM. In an expanded system, this means 64k for the RAM disk and 64k for the user, but with extra memory, any multiple of 64k can be allocated to the RAM disk. When used, it is treated like any other disk — eg, in a system with two floppies it is drive C.

The Basic interpreter is a superset of Basic-86, the extensions providing control over hardware features like the multi-page display, graphics, lightpen, function keys, RS-232 ports and sound generator. Interrupts generated by I/O devices like the RS-232 port or lightpen may be handled within a Basic program. A simple screen-based editor is included and, all in all, it is very similar to the advanced Basics found on other 8088-based micros, so software portability should not be a problem.

---

**Memory Map**

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>00000</td>
<td>RAM</td>
</tr>
<tr>
<td>FFFFF</td>
<td>Expansion RAM(1) (128k)</td>
</tr>
<tr>
<td>3FFFF</td>
<td>Expansion RAM(2) (128k)</td>
</tr>
<tr>
<td>5FFFF</td>
<td>Unused</td>
</tr>
<tr>
<td>B0000</td>
<td>Display RAM(1) (84k)</td>
</tr>
<tr>
<td>BFFFF</td>
<td>Display RAM(2) (84k)</td>
</tr>
<tr>
<td>C0000</td>
<td>Display RAM(3) (84k)</td>
</tr>
<tr>
<td>DFFFF</td>
<td>ROM (Chinese Characters) (128k)</td>
</tr>
<tr>
<td>FFFFF</td>
<td>ROM</td>
</tr>
<tr>
<td>FC000</td>
<td>Character Generator (CG) (64k)</td>
</tr>
<tr>
<td>FE000</td>
<td>BIOS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Address</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0000</td>
<td>System RAM - 384k max.</td>
</tr>
<tr>
<td>00000</td>
<td>000</td>
</tr>
<tr>
<td>00001</td>
<td>000</td>
</tr>
<tr>
<td>00002</td>
<td>000</td>
</tr>
<tr>
<td>00003</td>
<td>000</td>
</tr>
</tbody>
</table>

**Graphics**

Graphics features such as copying a portion of the screen into an array and back again, filling an arbitrary shape with colour, drawing circles and rectangles, and turtle-like graphics are all provided, and in many cases coordinates may be given relative to the last point plotted, instead of the normal absolute form.

When working in colour, the programmer may specify colours directly, or he or she may use up to 16 palettes, assigning a single colour to each. All palettes may be used for text, but only palettes 8 to 15 apply to the graphics display. The advantage of the palette concept is that changing the colour assigned to a palette instantly changes the colour of anything drawn with that palette. One use for this feature would be to set a palette to the current background colour, draw a shape, and then change the palette's colour so that the shape (however complex) would appear at once instead of being built up gradually. Of course, drawing the shape would still take time, but the effect could be neater. I am sure that imaginative programmers will find other uses for this feature. Palette changes are simplified by the PALETTE USING statement which 'loads' all 16 palettes with a set of colour codes that has been stored in consecutive elements of an integer array.

**Benchmark timings**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM1</td>
<td>1.5</td>
</tr>
<tr>
<td>BM2</td>
<td>5.0</td>
</tr>
<tr>
<td>BM3</td>
<td>10.5</td>
</tr>
<tr>
<td>BM4</td>
<td>10.5</td>
</tr>
<tr>
<td>BM5</td>
<td>12.5</td>
</tr>
<tr>
<td>BM6</td>
<td>23.5</td>
</tr>
<tr>
<td>BM7</td>
<td>36.0</td>
</tr>
<tr>
<td>BM8</td>
<td>3.5</td>
</tr>
</tbody>
</table>

All timings in seconds. For a full explanation of Benchmark timings, see PCW November 1982.

The MB16001 boasts complete compatibility with non-graphic software for the IBM, while graphics programs will need some changes to allow for the Hitachi's higher resolution. I found little to contradict this claim, except that the two Basics use different tokens. Also, the MB16001 cannot run the IBM's Basic interpreter as much of the latter is stored in ROM. This means that programs must be saved as ASCII files and not in the usual tokenised form if they are to be transported between the two machines.

The Benchmark times for the MB16001 are very respectable, and would put the
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**Technical specifications**

- **Processor**: 8088
- **Memory**: 128k RAM, 8k BIOS ROM, 8k character generator ROM, 192k screen RAM
- **Screen**: 14 in colour monitor. 24 rows of 40 or 80 characters, graphics resolution to 640x400, 15 colours. Monochrome optional.
- **Keyboard**: 97 typamatic keys, including function, numeric, and special keys.
- **Disks**: Two slimline double-sided, double-density 5¼ in drives.
- **Interfaces**: Centronics parallel, RS-232 serial.
- **Operating system**: MS-DOS
- **Languages**: Microsoft Basic (others as options)
- **Dimensions**: 30cm x 49cm x 25cm

Machine in equal fifth place in the 'league table' published in *PCW* November 1982 (remember that BM8 now performs 1000 iterations). Since we do not use a set of graphics Benchmarks (we had enough trouble with the disk tests), an assessment of a machine's speed in this area is necessarily subjective, and questions of resolution and memory or colours cloud the issue. The MB16001 does seem to perform well in this area: at 640x200 resolution, drawing and filling in the largest possible right-angled triangle took four seconds.

Also supplied with the review system were Wordstar (configured for the IBM) and Zork I (likewise). The Wordstar customisation makes good use of the special keys on the MB16001, while the 'standard' control keys still work. I must admit to spending a lot of time playing Zork — it's a very engrossing adventure-type game with many puzzles to test the imagination.

Hitachi is optimistic that there will be a range of business software for the machine. The only applications packages available from the company itself are Wordstar, Spellstar and a first generation spreadsheet product, BM-Calc, written by Hitachi. 'But some 20 packages were demonstrated running on the machine when we exhibited it at the Which Computer? Show last year,' said a Hitachi spokesman. Apparently the company has been approached by 85 software houses and 900 dealers all wanting to get involved in the machine.

**Documentation**

The documentation supplied with the review system was an advanced draft in the form of a 3.5cm wad of unbound A4 paper.

English language documentation for MB16001 operations, MS-DOS and GWBasic has been produced by Hitachi in Japan. It will be presented in ring binder format but was not available at press time.

The locally revised manual I used is distinctly better than much of the documentation supplied with Japanese equipment, but it is a shame that one of the demonstration programs listed still plays the 'Rising Sun' anthem. There are many such samples of programs illustrating different features of the language, as well as sections which describe the use of files, graphics, and machine code routines, as well as the everyday parts of the language. Apart from the page numbering, the fact that the manual separates statement and function keywords makes reference tricky (am I the only person who thinks a single alphabetical sequence would be better?).

**Expansion**

The MB16001's user memory may be expanded to either 256 or 384k. This limit is not justified in any way (there are enough slots for more memory cards), but I would hazard a guess that either power consumption or heat dissipation is the reason. Be warned that adding memory won't let you run bigger Basic programs — the Basic-86 interpreter uses a single 64k segment for program and variable storage — although compiled programs can span segments.

An external twin disk unit may also be connected to the standard controller, doubling the total capacity of the system. If this is inadequate, a pair of 8 inch drives can be added instead, although they require their own controller. In this case the total capacity is 2.64 Mb (2x1 Mb plus 2x320k). Even greater storage will be provided by a hard disk unit, but details of this were not available at the time of writing.

The manuals also mention a 'lightpen', as well as additional Centronics, and RS-232 interfaces. All these items should be in stock by the time the MB16001 is launched.

The expansion connectors have the same pin configuration as the IBM PC, but there is of course no guarantee that any particular card intended for the IBM will work perfectly (or even at all) in the MB16001.

**Prices**

The price for a standard system (as tested, but excluding Wordstar and Zork) has yet to be decided. Informed guesses put it between £2000 and £3000 but probably close to the top of this range. Prices for the add-ons are not yet known but, when they do appear, check whether installation is extra because the manuals warn that fitting them yourself will invalidate the warranty.

**Conclusions**

One thing is certain, the MB16001 — with features that are optional extras on competing machines — gives you a lot for your money. It has a standard operating system and a version of Basic that is as compatible with similar systems as an extended Basic ever can be. Compatibility (even if it is not absolute) with the IBM is a good selling point, as it increases the range of readily available software and hardware.

On price, competition with IBM will be, close. An IBM Personal Computer with 128k RAM and colour monitor costs £3127 + VAT.

It is obviously a 'serious' business or professional computer, and it will be getting the software it deserves. If the system doesn't live up to its name I will be astounded.

**Editorial note**

Steve Withers benchtested this machine in Australia which is the standard testing ground where Japanese manufacturers dry-run their products.

The UK version, scheduled for launch this July, is the same as the Australian version apart from some marketing details. Hitachi's Australian dealer, in its infinite wisdom, dubbed the machine The Hitachi Success. The UK company has thought better of this and here we have The MB16000 Series!

CP/M-86 is expected in Australia but is not planned for the UK.
ROOT EXTRACTION

John Kerr of Glasgow has been thinking about, and working on, Steven Weller’s fast square root programs (August 82) and the very attractive algorithm they used, with the object of seeing if this might be adapted to other roots. He has discovered that the algorithm can indeed be adapted for any root.

Here is John’s account of the square root algorithm, showing how it is adapted for cube roots. You might like to try your hand at producing code from this, before we print John’s 16-bit and 32-bit unsigned integer cube root routines for the Z80 next month.

In Mr Weller’s algorithm for square root extraction, the input number is shifted left, two bits at a time, into a working accumulator. At some arbitrary stage in the process, the ‘virtual input’ is that part of the input which has been shifted in and operated upon; call it ‘x’. The results of processing this input are a new partial result ‘s’ for the square root, and a partial remainder ‘r’ in the working accumulator:

\[
\text{virtual input } = x, \\
\text{partial result } = s, \\
\text{partial remainder } = r.
\]

These quantities are related by the equation: \( s^2 + r = x \).

After the next round of processing, the virtual input has been augmented by the next two-bit number ‘y’. The result has been found; call it ‘d’, so the new partial result is \( 2s+d \). The remainder has also changed:

\[
\text{virtual input } = 4x + y, \\
\text{partial result } = 2s + d, \\
\text{partial remainder } = q.
\]

So the previous equation now becomes: \( (2s+d)^2 + y \). Combine the two equations to eliminate ‘x’, remembering that as ‘d’ is a single bit (zero or one), \( d^2 \) reduces to \( d \). The result is:

\[
q = 4r+y \text{ when } d=0, \text{ indicating that nothing has been subtracted from the working accumulator; or else, } q = 4r+y - (4s+1) \text{ when } d=1, \text{ ie, the result is set.}
\]

This shows that the required subtrahend is \( 4s+1 \); that is, the previous partial result shifted two places left, then incremented.

The same analysis can be applied to a hypothetical algorithm for extracting cube roots. It holds the subtrahend value which should be used, if the method is to be sound. Starting again at some arbitrary point during execution, we have:

\[
\text{virtual input } = x, \\
\text{partial result } = c, \\
\text{partial remainder } = r, \\
\text{this time related by the equation: } c^3 + r = x.
\]

Now the next three bits of the input number are shifted into the working accumulator, giving the new virtual input of \( 8x+y \). After processing, a new result bit ‘d’ and a new partial remainder have been calculated:

\[
\text{virtual input } = 3c + d, \\
\text{partial result } = 2s + d, \\
\text{partial remainder } = q.
\]

And after a little more algebra, the following algorithm, devoid of full-length multiplication, is obtained.

**Clear accumulators for result (Res), subtrahend (Sub) & remainder (Rem). For each group of three input bits:**

1. **Shift three bits left into Rem**
2. **Sub=4*Sub + 18*Res.**
3. **Res = 2*Res + 1;**
4. **If Rem > Sub, Then let Rem = Rem - Sub;**
5. **Else let Rem = 2*Res;**
6. **Sub = 4*Sub - 6*Res.**
7. **Next group.**

### 6809 TOKENISED TEXT

People are beginning to ask why Sub Set includes nothing for the 6809 processor used by the Dragon 32 and Tandy colour computers. In fact, somewhat ahead of this request, we have already begun to write 6809 code in the Sub Sets for June and September 1981 and that is all we have received — until now. We are prepared to pass on your 6809 Datasheets, untested for the time being, until we can determine the extent of your interest.

Michael Kerry of Seaford is the first of what might be a new wave of 6809 coders and our first Datasheet this month is his translation of Bruce Tanner’s Z80 text expansion routine TOKN (November 82).

In this application, non-ASCII single byte tokens are used to represent common phrases or combinations of letters. Michael uses tokens in the range FFH to 80H, reversing the sequence used by Bruce. To adapt the example given by Bruce, a first token for the letters THE is defined as hexadecimal 54 48 4F 00 (the zero byte terminating the definition), a second for THE as FF 45 00; a third for THEATRE as FE 41 54 52 4F 00. The token FF in the definition of THE represents the letters TH and the token FE is in the definition of THEATRE represents THE.

‘Tokenised’ text, ending in a zero byte, consists of ASCII characters and tokens. Using the three tokens defined, the text ‘THIS THEATRE IS THE THIRD OF THREE THEATRES’ would be tokenised with the hexadecimal bytes:

```
FF 49 53 20 FD 20 49 53 20 FF 20 FF 49 52 44 20 4F 46 20 FF 52 45 4F 20 53 00
```

‘Tokenised’ text has had a fascination for me since the time I used Bentley’s Second Phase Code to save money on cables in overseas trading. ‘Balance — are working, will telegraph later’ is a phrase that sticks in my mind from many years ago. Why not think about the most useful phrases or combinations of letters for your text compression needs and send them in?

### DATASHEET

1. **TOKN** - Expand tokenised text to ASCII
2. **CLASS**: 2 (Does not save CC & A but position independent & re-entrant)
3. **TIME CRITICAL**: No
4. **DESCRIPTION**: Outputs ASCII text, expanding tokens into full text.
5. **ACTION**: Outputs all ASCII characters. Recursively expands tokens.
6. **SUB DEPENDENCE**: Subroutine OUTPUT to output the character in the A register.
7. **INTERFACES**: 1) Memory area holding text and tokens. Tokens are in the range hex FF thru 80 (-I)
8. 2) Memory area holding un-numbered token definitions, each terminated by a null. The first definition corresponds to token hex FF. Recursive definitions
Both John Hardman of Wel-ling and D Swain of Muswell Hill have sent the same improvement to the FOWIAD routine which appeared in February's Sub Set. This improvement shaves one byte of FOWIAD: EX Fox of Luton did in the improved version he sent in (see Fig 1 below). EX(SP) is a 1-byte, 19 T-state, Z80 instruction. EX(SP),IX or IY takes 2 bytes and 23 T-states. 'EX(SP),DE' can be achieved in 3 bytes and 27 T-states. Is there any call for 'EX(SP),BC' or even 'EX(SP),AF' and how would you do it?

![Fig 1](https://via.placeholder.com/150)

**THOSE INTRIGUING 8085 INSTRUCTIONS**

Peter Caunt of Knaresborough has written to tell of the mixed success he has had on testing the 9 unspecified instructions discovered by Jonathan Martin (February 1983).

His findings agree with Jonathan's on three of the instructions (see Fig 2 below).

However, Peter found code 10 (hexadecimal) to be a 'SRA HL', a 16-bit arithmetic shift retaining the sign in bit 15, and not the 16-bit rotation which Jonathan's machine thought it was. The 2-byte instructions, 28 bb and 38 bb which add immediate a single data byte value to HL and SP respectively were completely ignored by Peter's machine. Bit 5 of the flag register (supposedly a 'correct sign' flag, K) resisted all Peter's attempts to set it.

This raises an important point about unspecified instructions. The fact that they are unspecified does mean that they cannot be guaranteed to work at all or, even if they do, produce identical results on different chips.

Peter also tested the only other unused 8085 instruction, not mentioned in February. 08 works on his Alphatronic as "SUB HL,BC" and sets flags accordingly.

What about the 8080? All the above mentioned codes and also 20H and 30H are unused by the 8080 processor - or are they? Perhaps some DAI-hard reader could furnish us with the answer.

**HIP-HIP-ARRAY**

How do you store a two-dimensional array of matrix in linearly addressed memory?

**DATASHEET**

```
; ; MATRAN - Matrix Transposition
; ; CLASS: 1
; ; TIME CRITICAL?: No
; ; DESCRIPTION: In RAM move of a two dimensional array
; ; or matrix effecting a change from sequential row storage at source to
; ; sequential column storage at destination, or vice versa.
; ; ACTION: For each column of Source
; ; Save Source pointer
; ; For each row of Source
; ; Move element from Source to Destination
; ; Increment Destination pointer
; ; Add No. of columns to Source pointer
; ; Restore Source pointer
; ; Increment Source pointer
; ; SUBD DEPENDENCE: None
; ; INTERFACES: Destination area of RAM equal to Source area of RAM
; ; INPUT: HL is pointer to start of Source matrix
; ; IX is pointer to start of Destination
; ; B is no. of rows in Source matrix (1 to 255)
; ; C is no. of columns in Source matrix (1 to 255)
; ; OUTPUT: Transpose of Source matrix at Destination
; ; All registers returned unchanged
; ; REGS USED: B, C, HL, IX
; ; STACK USE: 12
; ; LENGTH: 33
; ; TINE STATES: (rows * 60 + 67) + cols * 129
; ; PROCESSOR: Z80
```

**DYNAMIC STORAGE**

Quote of the month from John Kerr, referring to one of his less successful coding efforts: 'due to an erroneous 'RET', it uses the peculiar technique of storing an intermediate column by column? - or row by row? Whatever way it is, MATRAN from John Hardman will let you reconfigure it.
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VARIABLE SEARCH

Thinking that most people who do any programming of a reasonable length sometimes lose variables, I hope this routine will be of some help. It searches through the variables section in the memory of any ZX Spectrum, and will print out the names and types of every variable used in the program. If you know what variables should have been used, then coming across an odd one should point out a bug. If you need a list of variables to aid conversion to a different machine, this will provide them. Running the program shown stores it in a REM statement; POKE 23756,0 will prevent it from deletion. The rest of the program can be removed by typing in the line numbers — do not use NEW. Then PRINT; RANDOMIZE USR 23760 will list all the variables that have been set up on the screen.

For example:

```
10 FOR N=1 TO 23040: NEXT N
190 DATA 215,185,211,92,200,31,256,0
192 DATA 200,71,62,96,176,215,6
240 DATA 200,71,62,96,176,215,6
500 DATA 230,71,62,96,176,215,6
520 DATA 200,31,62,96,176,215,6
540 DATA 200,71,62,96,176,215,6
560 DATA 200,71,62,96,176,215,6
580 DATA 200,71,62,96,176,215,6
600 DATA 200,71,62,96,176,215,6
620 DATA 200,71,62,96,176,215,6
640 DATA 200,71,62,96,176,215,6
660 DATA 200,71,62,96,176,215,6
680 DATA 200,71,62,96,176,215,6
700 DATA 200,71,62,96,176,215,6
720 DATA 200,71,62,96,176,215,6
740 DATA 200,71,62,96,176,215,6
760 DATA 200,71,62,96,176,215,6
780 DATA 200,71,62,96,176,215,6
800 DATA 200,71,62,96,176,215,6
820 DATA 200,71,62,96,176,215,6
840 DATA 200,71,62,96,176,215,6
860 DATA 200,71,62,96,176,215,6
880 DATA 200,71,62,96,176,215,6
900 DATA 200,71,62,96,176,215,6
920 DATA 200,71,62,96,176,215,6
940 DATA 200,71,62,96,176,215,6
960 DATA 200,71,62,96,176,215,6
980 DATA 200,71,62,96,176,215,6
```

The routine only prints out the first eight binary bits of a number so, for example, typing 'SHUT 301' would give 00101101 which is equivalent to 'SHUT 45'.

Bill Longley

ATOM BINARY COUNT

This routine provides the Atom with a binary printout facility. The program should be typed in and then run.

The machine code should then be saved on tape as shown in the program. The basic program can now be erased by typing NEW.

To use the facility the SHUT command is used — eg, typing 'SHUT 198' will cause the binary number 11000110 to be printed out.

It is also useful to find which bits in a byte are set or un-set. Typing 'SHUT? B001' will tell you which bits of Port B of the PIA are set.

John Friar
MORE NOTES ON THE SUPERBOARD

While the contribution to T.J.’s Workshop from David Eastlake on music for the UK101 (September 1982) was useful in principle, the idea can be significantly improved. Firstly, POKEing 61440 with either 64 or 0 will disable the cassette using 81 and 17 instead will have the desired effect of switching RTS on and off without corrupting the cassette interface. Secondly, Basic isn’t fast enough to give a reasonable range of notes, and rapidly changing notes are virtually impossible. Thus, when I decided to produce music on my Superboard, I wrote a machine code routine to produce the sound, a full assembled listing of which is given. As printed it is located at the end of memory on an 8k machine, and should be protected by answering 7979 to MEMORY SIZE. To use the routine, first set the USR vector with POKE11,51:POKE12,31 then execute the instruction X3+USR(D*256+F/8) where F is the required frequency of the note (in Hz) and D is the duration (in 32nds of a second). For example, to have half second on of a note at 600 Hz, use X+USR(16*256+600/8) or more simple X+USR(4171). F can be in the range 56 to 2040 and D can be in the range 0 to 127 (D can be larger, up to 255, if you make the argument of USR the appropriate negative value corresponding to a positive value greater than 32767). If D=0 then the program will produce just one cycle of the note. Here is a small Basic program that produces a variety of different sounds using the routine, many of which I’m sure you can imagine uses for in your latest Invaders program. Those musically inclined can no doubt squeeze tunes out of their computers with a bit of extra software — how about a quick burst of the Death March when you finally get eaten/squashed/blasted for example?

On the hardware side, I didn’t find it necessary to use anything as advanced as an amplifier. I simply inserted a spare 74LS04 from U68, then took the signal from pin 6 of J2. This, when connected with ground across an 8W0.5W speaker produced a sound of perfectly adequate volume.

David Harrison

SPECTRUM INS & OUTS

Chapter 23 of the Sinclair manual mentions the use of the ‘IN’ command as a substitute for ‘INKEY’S’. What it does not mention is that if the ‘IN’ command is used it enables several keys to be pressed at once. This can be very useful as it allows, for instance, multiple-player games.

The chapter gives a list of some of the most useful addresses for half-rows, but entire rows can also be used. The addresses for these can be found with a little patience using the following program:

10 FOR n=1 TO 10000
20 PRINT AT 10,10;n:AT 12,10;IN n
30 IF INKEY$="m" THEN NEXT n
40 GOTO 20
Pressing any key apart from ‘n’ will show whether the current ‘IN’ address detects that row. Pressing ‘n’ will increase the address by one.

The ‘OUT’ command, which is also dealt with in chapter 23, can be used to produce flashing border effects useful for arcade games. This is done by using the following routine:

10 FOR j=1 TO 100:OUT 200,RND * 255:NEXT n

Christian Livingstone and Piers Ludlow

NEWBRAIN CLOCK

Here’s a tip for Newbrain owners, to put a digital clock onscreen. The clock is interrupt-driven, so by intercepting the interrupt it should be possible to have a clock onscreen while allowing normal operation of the machine although the display would have to be of the manual, as influenced using machine code. The program is entered as one line.

10 PUT 7,22,10,10: a = PEEK(105)*256+PEEK(106)+PEEK(107): h=INT(a/150000):
a=a-180000*h: m=INT(a/3000): a=a-30000*m:
a=INT(a/50): PRINT

Stephen Burt
Sage for those who demand more and more and more....

If your application is too demanding for small-fry microcomputers, if it looks as though only a mainframe will do – think SAGE and save money.

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*Tested by MicroProducts Software Ltd using SAGE II
**BEEB DEBUGGING AID**

This error-handling routine is for the BBC Micro, and is intended as an aid to debugging (and encourage the user's idleness). When control is transferred to this routine, it will report the error, then list the line that gave rise to it. The routine has high line numbers — convenient *SPOOL:*EXE use, and, since it fills the keyboard buffer using call 138, is suitable only for machines with OS 1.0 or above. The routine first places the string 'L' into the keyboard buffer (32320,32330), then converts the two bytes at zero page locations 8 and 9 which, it turns out, contain the value for the function 'ERL', into a string of ASCII numerals which are placed sequentially in the buffer (32340 to 32370). Finally, the code for carriage return is appended (32380), causing the command to be performed.

Ian D Kerr

---

**BBC BAD PROGRAM FIX**

I noted with interest the tip by David Julien Waring (January) on recovery of programs which came up with the message 'bad program'.

The BBC Computer is horribly prone to corruption of the first block, and in this event it can be very annoying as the program cannot be loaded at all. To overcome this I have devised the following method to load the program, list it, and insert the missing first block again to enable it to run.

Position the tape at the commencement of the faulty program and then take it out of the recorder. Place a new tape in the recorder and then type in a program of two lines, 10 and 20, each containing the maximum number of single characters (236). 'X' is convenient.

Save this program, naming it with the name of the program you are trying to recover, then rewind the tape. Reload the program, but press 'STOP' on the cassette player the instant the first block has loaded — this must be judged by ear alone. Replace the tape with the original program tape, press 'PLAY' and allow the program to continue loading. This will not quite fool the computer, however, and on completion of loading 'bad program' message will appear. This can then be recovered with the following modified version of Mr Julien Waring's fix. No line numbers!

```
A=&E00 : REPEAT X=A73 : IF A7X=A13 A=A4X : UNTIL 0 ELSE UNTIL 1 : REPEAT Z=A+1 : UNTIL 7A+2=13 : ZA+3=Z : Press 'RETURN' and wait for the prompt to reappear, when with luck the program should be listable. Of course the first few lines will only be 'Xs', but at least it is now capable of repair.
```

James R W Rye

---

**LYNX SCREEN**

One annoying fact of using personal computers on televisions is that the computer's display tends to slide off the edge of some TVs. However, if you are fortunate enough to own a Lynx, armed with the fact that it employs a 6845 VDU controller, you can move the computer display around to suit. To change the horizontal 'hold': Enter OUT 134,3 — then OUT 135,x (where x is a value around 65 — to choice). To change the vertical hold: Enter OUT 134,4 — then OUT 135,y (where y is a value around 72 — to choice).

Fiddling with the values of x and y should produce a very pleasing 'centred' screen! These changes will withstand NEW — but not a system reset.

Simon Brookes

---

**EASY KEYING**

The following simple technique enormously improves the feel of the ZX81 keypad, making it easier to use and giving a degree of positive feedback to each key depression.

Selecting a key, feel for a circular recess beneath the plastic face; this recess contains the key contacts and is 1cm in diameter. Taking a ballpoint pen, carefully trace a circle on the plastic face following the inside edge of the recess and pressing just hard enough to score the plastic lightly. This causes the encircled section to rise into a small bubble on the key; you will now be able to feel the upper key contact which closes on the lower key contact with a detectable click. Repeat this procedure for all the keys. If you prefer not to mark the keypad then use a ballpoint with water soluble ink and clean it afterwards.

Simon McQuillen
O-Computers has done wonders for Osborne I. We call it Super Osborne. We added refinements and lowered prices to make it the best value-for-money microcomputer you can find. For £1099 + VAT (limited offer) we'll sell you an Osborne I with double density disks (RRP about £1500) and all of Osborne's free software. Add the beautiful new Silver Reed EX44 portable daisy-wheel printer (RRP £485) with cable for £399 and a 12 inch amber screen monitor (£110 + VAT) and built-in 80 column adaptor (£175 + VAT).

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O-COMPUTERS
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Telephone: 01-828 9000

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SHARP STRINGS
As Maurice Hawes mentioned in "Making the Most of the MZ-80K" (PCW March), Sharp SP-5025 does not allow string inequlity comparisons. The Basic program below POKEs into a machine code routine of my own which overcomes this drawback.

The program as presented is written for a completely unmodified Basic SP-5025, with the main part of the routine being placed at 3DDCH (15836 decimal) onwards. If this space is occupied by a Toolkit the routine may be placed elsewhere by altering the variable 'START' accordingly. If it is placed at 4B60H or above then other pointers within SP-5025 will have to be changed as explained in Maurice Hawes' article (the main routine occupies 79 bytes). It should also be noted that a subroutine is placed within the Basic so that it overwrites part of the original SP-5025 string comparison routine (from 2283H to 22AH). After doing this overwriting make sure that any Toolkit you might be using doesn't already require this area for its own purposes (there is no clash in this respect with the Knight's Commander Toolkit). If you do move the Basic text start address to make room for the above routine you might also have to put this address into locations 1208H (low byte) and 1209H (high byte) in order to prevent the routine being wiped out on cold-starting Basic.

The routine treats 'A' as less than 'B' as less than 'C'... and so on. Strings are compared letter by letter as far as possible. If all letters compared are the same then the longer string is considered to be greater. Lower case letters are taken to be equal to their upper case equivalents. The routine may be altered to make all lower case letters greater than all upper case letters if required. To do this POKE 8966,201.

Alan Stevens

ORIC TIPS
Something all the Orics reviews that I have seen so far seem to have missed is that by pressing ESC then to escape character (these are given on page 147 of the manual) colours, flashing and double height characters can be displayed directly from the keyboard. It certainly beats fiddling with PRINT CHR$(27),"escape character" for experimenting with graphics.

There is also a way of overcoming the seemingly famous TAB bug. Instead of using PRINT TAB(n);A$ use POKE 617,n,PRINT A$. Location 617 holds the horizontal cursor position, which can be changed at will during program execution. If location 617 is POKEd in immediate mode it alters nothing as the system's READY message resets the cursor to the far left.

If the GET and KEYS commands for testing the keyboard seem a bit awkward, as they rely on the auto-repeat facility or the repeated pressing of a key, you may find location 520 of use. The value of PEEK(520) is different for each key, but it remains constant while a key is held down. Unfortunately the value of PEEK(520) is not the same as the ASCII code for the key held down, but it is easy enough to find out what it is by typing something like this:

X=0: REPEAT: PRINT PEEK(520); UNTIL X=1 then pressing a few keys.

Philip Clayton

TAB TRICK
"Another key useful in special circumstances — like word processing", is the sparse information about the TAB key in the BBC User Guide. It is useful already, for normal circumstances.

Casual, mildly inquisitive prodding of the key by the user has probably demonstrated that the cursor is advanced one space per prod but does not backspace when the DELETE key is pressed.

All very well and good but not much use. I found, however, that if the TAB key is used instead of the space bar the spacers are not incorporated into the program.

Take the following program beloved by the furive Saturday morning key bashers assembled around the microcomputer counter:

10 FOR I=0 TO 10: 20 PRINT "HELLO": NEXT I

If the program is typed in using the space bar and the program length is found by the command PRINT TOP — PAGE we get 47. If the same program is now retyped using the TAB key to insert spaces the program length has shrunk to 25.

When the program is listed all the spaces have disappeared. To list the program with spaces use one of the LIST0 options (see page 290 of the User Guide).

Andrew J Edgington
IT'S NOT ALL GREEK TO CONTEXT

Microcomputers have become part of our culture. Yet most of them expect users to communicate in cyber hieroglyphs. C/WP CONTEXT is a new type of microcomputer designed to be easier to communicate with. In fact, it's two computers in one. Computer number 1 (a Z80A with 64k RAM, if you want a little jargon) does the hard slog on your programmes — any standard CP/M programmes. Computer number 2 (a 6502 with 32k RAM) concerns itself only with talking to you — in words or pictures — on the clear 12 inch screen. You'll be delighted by the sharp speedy graphics, and the steady readable characters. And you can mix words and pictures as much as you wish. But that's not all. CONTEXT'S screen handling computer allows you to overlay one character over another, add in accents, or underlining, or bold characters, and to make your own symbols Russian, Greek, mathematical, what you will. It's certainly not all Greek to CONTEXT. And you'll enjoy the price too — computers, screen, twin disc drives, Wordstar, software all for £1495.

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THE REALLY VERY FRIENDLY COMPUTER
Philip Lewis describes how he stumbled into the world of creative cross figures nine years ago. Since then his enthusiasm has remained unabated. Here he eagerly imparts his knowledge to those mathematical freaks among us.

It was summer 1974, and I had just arrived in Malta. Browsing in the hotel's bookshop, I picked up a faded and dusty paperback called 'Cross-Figure Puzzles'. What on earth...? I opened the book and was transported into a miniature new world. Unfortunately, this little world was and still is sparsely populated. Colonists are very welcome and there are golden opportunities for explorers!

But before you rush to join the queue, let me tell you what cross-figures are all about. First of all, they are not to be confused with (what I call) cross-numbers. These you may have met in school text-books or puzzle magazines. As with (normal) crosswords, the clues in cross-numbers are independent. Here's a sample 3x3 cross-figure to practise on:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

Across
A 1-Cross x 3
B Multiple of 3

Down
A A-cross + 6
B C-cross x 5

(Don't get confused by the letter-labelled clues. After all, if you have number-labelled clues for crosswords, it makes sense to have letter-labelled clues for cross-figures. The letters are not variables but simply labels.)

Now let's take a look at those four clues:
C-cross is a multiple of 3. That's no great help. We shall need to know more about A-down or B-down first.
A-down is A-cross plus 6. Here we obviously need to pin down A-cross first.
A-cross is three times C-cross. Yes, that we could use. Cross-figures do not have 'leading zeros' any more than crosswords have 'leading blanks', so C-cross must be between 100 and 333, while A-cross must be between 300 and 999.

So, with this in mind, I kept a sharp lookout as I worked my way through the book and managed to eliminate a clue in several other puzzles. That whetted my appetite, and when I got to the end of the book I went back and tackled all the puzzles again with new analytical ideas. This time I found at least five clues could be trimmed from the 25 to 35 clues provided.

One day I completed a puzzle and noticed with surprise that I had not used one of the clues. That particular clue was clearly redundant.

Now, information redundancy — or, rather, its absence — is an essential aspect of mathematical elegance. To illustrate this idea at its simplest level, no one grappling with a problem like 'Find the value of X when X+2=5' needs the additional information that 2x=6!

Incidentally, this particular cross-figure has been solved by several children in the 9-12 age group.

Cross-figures present much the same sort of problem in the mathematical field. As the clues are interdependent, where does one start? Here's a sample 3x3 cross-figure to illustrate:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Across
A C-cross x 3
C Multiple of 3

Down
A A-cross + 6
B C-cross x 5

Now let's get on to cross-figures. Have you ever seen a crossword with clues like 'This is what a 5-across might give you if you asked him for a 10-down'. So you look up the clue for 5-across but only when the weather is 1-down.' And so on. Exasperating! How do you begin? The clues are interdependent. You have to find a way in.

Cross-figures present much the same sort of problem in the mathematical field. As the clues are interdependent, where does one start? Here's a sample 3x3 cross-figure to illustrate:

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

Across
A 2-9
C 592 + 609 - 465

Down
A 27x21
B 299808 + 1388

In this sort of 'puzzle', you can start where you like, because the clues are independent. Cross-numbers are useful in the classroom because they look more independent. Cross-numbers are useful in the classroom because they look more independent. Cross-numbers are useful in the classroom because they look more independent.

For explorers!
more difficult to eliminate a further one.

In the summer of 1976 I acquired a pocket calculator and tackled the whole business again — this time with the application of elementary Information Theory. By the October of that year I had reached an average elimination level (for standard 9x9s) of 31 per cent of the given clues — not far short of the absolute maximum, I thought. (Wrong again!).

With this method I eventually reached an elimination level — mainly in the 40-50 per cent range.

That brings us to the main purpose of this article. I had been wondering for some time whether cross-figures could be programmed, so that autumn I joined a course to study assembly code with only 200 addresses. As soon as I had acquired all the code words and run a few simple programs, I tackled the problem of programming a 4x4 cross-figure, without even knowing whether 200 addresses would be enough for the job. That turned out to mean two months' hard work, with the final instructions being written in under the 200-address limit. The cards were fed into our old IBM 1440 and out came the correct solution. My first cross-figure program was born.

And that was as far as I could go. I programmed another 4x4, but the language was inadequate for larger cross-figures. So the following autumn I took up Fortran and Cobol. Within a few weeks I had run successful programs for 4x4s in both languages, although it became painfully clear that using Cobol for that purpose was rather inefficient in run-time, even if not in terms of program-writing time.

So far so good... It was but a short step to writing successful programs for 9x9s. Or so I thought... Computers laugh at problems... You will find that cross-figures can be programmed in several ways. I think I have tried most of the possible approaches under my general strategy, but you may come up with a new approach or even win fame and fortune by developing a completely new strategy.

1) Lower and upper limits of grid numbers may be determined by inspection of the grid. A three-digit number, for example, obviously lies between 100 and 999.

2) In order to remove subtraction, division and root operators, clues may be 'switched around' before being put into the program. In algebraic terms, $a = b - c$ becomes $b = a + c$ $a = b / c$ becomes $b = ac$ $a = \sqrt{b}$ becomes $b = a^2$

3) The clues, taken as a whole, may be analysed in order to determine which of the grid numbers are 'primary' and which are 'derivative', in terms of ascending order. In the clue 'A-down is seven times C-across', for example, C-across is primary and A-down is derivative.

4) Apart from the above, no mathematical calculations or deductions are to be made outside the actual program.

5) The program must not only find a solution but also show that there is only one solution or (horrors!) show that the compiler has made a mistake and there is more than one solution.

Do any of these cross-figure puzzles have redundant clues? If so, what are they?
**CROSS-FIGURES**

**Across**

A (Four) Digits total 19
D Square of E-across

**Down**

A D-across x B-down
C Twice A-across
E See below (if you must!)

First theatre in England opened in year 1. (see dotted squares). Puzzle can be solved without the extra clue: use a calculator!
E-down is multiple of 11.

---

**COMMUNICATIONS**

PCW welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Please note that we are unable to give advice about the purchase of computers or other hardware/software — these questions must be addressed to Len Warner (see 'Computer Answers' page). Address letters to: 'Communications', Personal Computer World, 62 Oxford Street, London W1A 2HG.

---

**Babbage rules**

OK

As my original article was concerned with Charles Babbage only, I feel that I must reply to L E Weavers appraisal of Ada Lovelace (March 1983 Communications).

The role of Ada Lovelace in the development of the Analytical Engine has until recently been over emphasised. In 1840, Babbage travelled to Turin to present a series of seminars on his Analytical Engine to a group of Italian scientists. It was his intention that one of them would publish an account of the machine. This role was performed by a young military engineer, L F Menabrea, who published his account in 1842.

The account was subsequently translated from French into English by Ada Lovelace (she became interested in the Analytical Engine in 1841). Under the consultation and guidance of Babbage, extensive notes were added to the translation. The translation and notes formed the most important paper in the history of computing predating the modern era.

It was in direct consequence of this, that Ada Lovelace's role in the development of the Analytical Engine has been over estimated. The programs she discusses were developed by Babbage (by as much as 5 years beforehand), and taken to Turin.

Ada Lovelace did, however, perform her role as a publicist extremely well indeed, but her influence on the development was not as much as had been supposed.

It is worth noting that the naming of the (new?) computer language by the United States Department of Defence was performed before the true role of Ada Lovelace was uncovered.

For those interested, there is a major reprint series currently in progress of major works in the history of computing, published by the Charles Babbage Institute in the United States. One of these is Babbage's Calculating Engines, a collection of Charles Babbage's works assembled by his son, Major General H P Babbage, which was published originally in a limited edition in 1889.

Queries concerning the series should be directed to the publishers — Tomash Publishers, PO BOX 49613, Los Angeles, California 90049.

**Satellite tracking**

I refer to the letter written by Mr John Evans in your feature 'Communications' in the April issue of PCW, wherein he complains that most micros leave out the inverse trigonometric functions Arc sine and Arc cos. Moreover, in order to remedy this apparent deficiency, he has kindly supplied a very crude iterative subroutine which calculates Arc sine.

I am surprised that he has not delved more deeply into advanced mathematics books since in them he would find the necessary formulae for Arc sine and Arc cos. The following formulae show the necessary relationships:

\[
\text{ARC SINE}(X) = \text{ATN}(\text{SQRT}(1 - X^2))
\]

\[
\text{ARC COS}(X) = \text{ATN}(\text{SQRT}(1 - X^2)/X)
\]

The complete solution for Arc tan (and hence for Arc cos and Arc sine) can be performed with the following program:

1000 REM SUBROUTINE FOR ARCTAN
1010 IF X1 > 0 THEN
1020 THEN THETA = 180 × ATN(Y1/X1)/3.14159
1030 ELSE
1040 IF X1 < 0 THEN
1050 THEN THETA = 180 × ATN(Y1/X1)/3.14159 - 180
1060 IF X1 = 0 THEN
1070 THEN THETA = 90

1080 IF ABS(X1) < 0.000001 AND Y1 > 0 THEN
1090 THEN THETA = 90
1100 IF ABS(X1) < 0.000001 AND Y1 < 0 THEN
1110 THEN THETA = 90
1120 IF ABS(X1) < 0.000001 AND Y1 > 0 THEN
1130 THEN THETA = 270
1140 IF ABS(X1) < 0.000001 AND Y1 < 0 THEN
1150 THEN THETA = 270

---

**Tough contender**

Having just read your report on the 'LSI-M4' in the April edition of PCW by Jane Bird, I was rather disturbed to find that you did not like the packaging of the system. I use the company's 'LSI-M3' a lot
COMMUNICATIONS

and find that the keyboard is just right, if used in the correct environment, eg, on a desk. Incidentally, the break key is also user definable!

I personally am quite pleased about the 'excessively thick and strong case' as on one Sunday morning I was busily programming away when I heard a creaking from above.

On looking to see where the noise was coming from, I was just in time to see the shelf above me holding about three quarters of a ton of paper breaking away from the ceiling! I pushed myself away from the table only to see the M3 being covered by the falling paper; the keyboard shot across the room; the M3 went beep. I thought all was lost.

After some ten to fifteen minutes of removing the paper from where I thought the machine should have been, I saw my first glimpses of the M3 - it was still running!

On revealing the M3 further, locating and plugging in the keyboard, I did a couple of routine checks. Everything was in order. That was last November; this letter was written on the M3 using Wordstar which is very easy to use with the aid of all the function keys.

M I Cohen, Northolt, Middlesex
We used ours as a stepladder - Ed.

Computer's advertising error

I am writing to draw your attention to a very misleading claim being made by Computurers Limited in their advertising of the Lynx microcomputer.

I recently brought a Lynx from a shop in the Spectrum chain. One of the main reasons for my choice of machine was the RS232 serial port as standard. This serial port is described in the Lynx sales brochure, and indeed mentioned in Computer's full page advertisement in the May issue of PCW. The Lynx manual also outlines the use of LPRINT and LLIST when using an RS232 printer.

Unfortunately, the Lynx does not have an RS232 port. There is a socket on the back of the machine marked 'serial', but it will not drive a serial printer, or any other RS232 peripheral.

After a telephone call to Computurers, I gather there is no intention of rectifying this omission. I have therefore returned the machine and obtained a refund, and hope that anyone else who has been misled in this way will do likewise.

Christopher Nelms, Godalming, Surrey
Computurers regrets its misleading advertising, and will be using the phrase 'serial port' in future. The company is supplying a special lead and software support for RS232 with commands listed in the newsletter. - Ed.

The agony and the ecstasy

As an avid reader and subscriber to your esteemed journal, I feel entitled to offer helpful criticism. Your indexing method is positively lousy! This is most surprising since you and your contributors frequently and correctly rebuke computer manufacturers for their poor documentation. Furthermore, your clever little 'Goto' instructions in the middle of articles often direct me to the wrong page. I suggest that you replace the entire editorial book by a reliable (probably Japanese) microchip.

Why all the fuss? Because I have just spent 2 hours trying to trace that wonderful article by Bob Huckle on 'How to make Epson, Wordstar and Osborne sing and dance'. Don't exhaust yourself looking it up, it's in the January 1983 issue on page 145. Perhaps you could drag him out of hibernation (if you haven't lost his address) and ask him to teach us how to use some of the graphic facilities on the Epson. Yes, I know the excellent Epson manual shows you how to do this using Basic, but I want to generate and use some Greek characters (alpha, beta, etc) in my Wordstar documents.

As a scientist (of sorts) I frequently use these characters and have tried to produce them by superimposing standard characters. Thus, an upper and lower case 'p' gives a passable beta - thus 'β. I can make a poor imitation 'μicron' by subscription a slash before the letter 'u' - and thus 'μ'.

However, I cannot make an alpha nor sigma. This could be the start of a new series of articles on useful graphics in place of wordy computer games. Perhaps one of your intelligent readers has already cracked the problem?

D C Weinkove, Stockport
PS Many months ago I submitted an amusing (I laughed) article on computers. Since then, I won my wonderful Osborne in a competition in the magazine Which Micro (bless them). I now wish to change the jokes and send the nonsense elsewhere. OK! Yes, I know you have lost the contribution! Anyone got any ideas? - Ed.

Revenge is sweet

I am writing to warn readers of the hazards involved when trying to sell software through professional software companies.

My problem started in September 1982 when, at the Personal Computer World Show, I approached a representative of the Bug Byte company with an item of software which I considered had a potential market.

Having given the representative a cassette containing the program and an operating manual, he said that Bug Byte would be in touch with me within a fortnight (ie, at the beginning of October). However, I did not hear from them, and so at the beginning of December I wrote to the company enquiring about what was happening. No reply was received from Bug Byte.

A telephone call was made to the same person who answered did not know the program and said that he would follow it up. On telephoning a few days later, he said that he had not been able to find the program. After further telephone calls Bug Byte was going to 'put something in the post' (I don't know what, since they said they had lost my program!).

However, nothing appeared. This was in January.
Richard Altwasser and Steven Vickers are the men who invented the Jupiter Ace.

After years of designing micro-computers that use BASIC (both men played a major role in creating the ZX Spectrum), they abandoned it in favour of FORTH.

FORTH is just as easy to learn as BASIC. Yet it's a faster, more compact and more structured language that educationalists and professional programmers alike prefer.

So the Jupiter Ace is the only micro-computer you can buy that is designed around FORTH.

Using it, there's little fear of accidentally 'crashing' programs halfway through and having to start all over again (a common fault with BASIC). The Jupiter Ace's comprehensive error checking sees to that.

The Jupiter Ace has a full-size keyboard, high resolution graphics, sound, floating point arithmetic, a fast, reliable cassette interface, 3K of RAM and a full 12 month warranty. You get all that for £89.95. Plus a mains adaptor, all the leads needed to connect most cassette recorders and TV's, a software catalogue (35 cassettes available, soon to be 50), the Jupiter Ace manual and a free demonstration cassette of 5 programs.

The Jupiter Ace manual is a complete introduction to personal computing and a simple-to-follow course in FORTH, from first principles to confident programming.

Plug-on 16K and 48K memory expansions are also available, at very competitive prices (there'll be a plug-on printer interface available soon, too.)

It'll take you no time at all to realise how clever Richard and Steven were to design the Jupiter Ace around FORTH. And even less time to realise what a silly price £89.95 is to charge for it.

Technical Information

Hardware
Z80A, 8K ROM, 3K RAM.

Keyboard
40 moving keys; auto repeat; Caps Lock.

Screen
Memory mapped 32 col x 24 line flicker-free display upper and lower case ascii characters.

Graphics
High resolution 256 x 192 pixel user defined characters.

Sound
Internal loudspeaker may be programmed for entire audio spectrum.

Cassette
Programs and data in compact dictionary format may be saved, verified, loaded and merged. All tape files are named. Running at 1500 baud.

Expansion Port
Contains D.C. power rails and full Z80 Address, data and control signals. Can connect extra memory peripherals.

Editor
Allows complete editing and listing of compiled programs.

Please send cheque/postal order to:
Jupiter Cantab Ltd., North Wing, Freemasons Hall, Bateman Street, Cambridge CB2 1LZ

Jupiter ACE

TOMORROW’S OFFICE
continued from page 156

Documentation

Tomorrow’s Office has two manuals — a traditional reference manual and a Training Guide. The Training Guide is good and clear, and has an index and some complete examples — unfortunately in my copy most of the printout from these was badly printed and very hard to read. The Reference Manual is better presented than most, with page layout and emphasis used to good effect. It does, though, take the common completely solution-oriented approach. This, combined with the more usual lack of an index, makes it quite hard to find particular pieces of information of the ‘I know I’ve read that somewhere’ kind. The confusion in ‘Tomorrow’s Office between the use of the word ‘index’ for a sorted list of keywords, so that you can have conveniently placed duplicates of functions such as ‘cape’, ‘lock’ and ‘symbol shift’. As far as I know the keyboard is only available from Buffer Micro Shop, 310 Streatham High Rd, London SW16. Tel 01-769 2887. The price is £49.50, and although the firm is a retail business it will accept mail order (if you send £51.50 to cover P&P).

K J Brickwood, London

Customer relations

We were sorry to see that Mr Ferguson had to resort to a letter to PCW (March), having tried to contact us on three separate occasions. It is true to say that the tremendous popularity of the BBC Micro and the general success of Acorn had caused our communications with some customers to become stretched to the full. This is precisely why we have established our Customer Services Centre, which is run under my direction. A new 10-line telephone system has been ordered specifically for customer enquiries. This installation will be in addition to the existing 10-line Acorn exchange — and when it arrives we will be fully operational. We have significantly increased the number of staff in the Customer Services team and will be dealing promptly with all queries like Mr Ferguson’s, and in his particular case we have already written to him and answered his questions.


Pat on the back

I applaud the recent moves in the editorial of this and other magazines to expose some of the blatant techniques used to market products that are by no stretch of the imagination ready. This is obviously a step in the right direction, but would it not be a giant leap in the right direction if this and other magazines refused to publish some of the more obvious transgressions?

Lain M Worthington, Nottingham

We do, or rather, we don’t — Ed.

TOMORROW’S OFFICE

Communications

Nothing more was done for a while, but at the end of February, Bug Byte was again telephoned to tell them that nothing had been received, and Mr Tony Milner promised to put something in the post the next day. However, again nothing arrived.

Since then another letter has been written to Bug Byte stating that if no reply was received, then letters would be sent to a number of computing magazines. Perhaps selling software through Bug Byte is in their own words ‘from difficult to suicidal’.

S J Harris, Bedford

Acorn replies

We are in regular contact with Morten Christiansen (PCW May 1983) and have already replied to him regarding his questions on 8in disk drives support. The BBC micro is a very flexible system and has the inherent capability of supporting 8in disk drives.

The market place is, however, moving increasingly to the 5¼in format and we have chosen to give this priority. The Z80 2nd professor (ANCOX) will include an excellent package of CP/M software on 5¼in disks at a planned price of £295. We also plan for key software houses to make additional CP/M software available in business format.

Rest assured that we intend to fully support serious business applications on the BBC Micro Computer.

D J Bell, Acorn Computers, Cambridge

Keyboard

Krisis

In your reply to the letter from S Douglas concerning alternative keyboards for the ZX Spectrum, you mentioned two that have no space bars.

Dean Electronics makes a keyboard that not only has a full-sized space bar and the break space key, but is also fitted with six spare keys. Using fine gauge wire, these can be connected to other keys, so that you can have conveniently placed duplicates of functions such as ‘cape’, ‘lock’ and ‘symbol shift’.

As far as I know the keyboard is only available from Buffer Micro Shop, 310 Streatham High Rd, London SW16. Tel 01-769 2887. The price is £49.50, and although the firm is a retail business it will accept mail order (if you send £51.50 to cover P&P).

K J Brickwood, London

Conclusion

Tomorrow’s Office, judged as a data management package, provides a good range of facilities for an application where interactive access to the data is through the primary key field. With this kind of data, you can extract, order, manipulate and maintain your data with a fair degree of flexibility and ease of use. It also provides a master/transaction file facility, the ability to have one master record associated with any number of transactions gives the user a virtually unlimited record size. So, for an application where primary key access is the norm, and particularly where the data is of the master/transaction record type, Tomorrow’s Office would be a very good buy, particularly as the package makes excellent use of the special features of the Sirius, the prompting and ‘help’ are well provided, and the facilities for printing reports are very good.

However, for applications with less well-structured data, the package might not be quite so appropriate. The restriction to 484 characters for a master record will often mean that the user must use two or more transaction records per master to get all the information; judiciously given the primary limit of 240 for master and 244 for transaction records where both are needed.

The restriction to a single screen-worth for display might mean that not all the data could be displayed at once. Further, the restrictions on access by other than the primary key could also cause problems in some applications, again where the data is less highly structured, particularly as the secondary indexes are not automatically kept up-to-date when data is amended or added. I was also rather disappointed that the facilities for providing users with special menus, and for storing commands in a file — while excellent as far as they went — did not include any form of conditional execution.

So once again, this is very much a ‘horses for courses’ situation. Tomorrow’s Office is a well thought out package with many facilities and on the whole a very good user image. If you have, or are thinking of buying, a Sirius, you would do well to give the package serious consideration, since for the right kinds of application it should prove a very good buy for the data management. But it is not, despite its name, an ‘integrated’ package, and for word processing and ‘calc’ facilities you would have to use Tomorrow’s Office in conjunction with other software.
In the latter part of last year I was asked to attend a small press conference held by Financial Director Software to launch its new suite of accounting programs.

The company's claims for its software were, it seemed, grandiose. The package was said to be so user-friendly that a bookkeeper or accountant with absolutely no computer experience at all could fire it up and use it straight away with no trouble.

Everybody claims that for their own software, said I. But everyone knows that user-friendly software is just as likely to bite your head off as to work properly for you. Financial Director's Managing Director Stephen Brookner insisted that using the Financial Director was, in principle, like using manual accounting books only much easier, because it took the long, hard work out of the process.

Being an out-and-out cynic I couldn't refrain from declaring, in MicroScope's issue seven, that the Financial Director might be good, but that only time and real, unbiased feedback would prove it.

This observation did not make me popular. Stephen Brookner — as our reviewer, Ian Griffiths of Accountancy Age, also notes — was not too pleased with me.

In December when he read my original article he rang me and issued a challenge: 'Find an accountant with no computer knowledge and he can prove its simplicity.'

Computer experts, according to Bryan Horton, Brookner's partner, have said the system is 'insultingly protective'. That for a start led me to think I was maybe being a little too harsh. Those words simply mean that error checking on input is stringent. And although this appears time consuming, in accounting it is more time-economical to get everything right from the beginning.

Ian has given the prices and most of the technical details necessary in this review. It was surprising to find that Financial Director Software's own books are kept on the package, running on a Millbank System 10 and, apparently, it runs very well on that machine. It is this computer which is used in the review which follows.

The Financial Director is now sold through 90 outlets nationwide. Each dealer is treated to a two-day, all expenses paid, intensive course in the use and sale of the package and basic bookkeeping. A diploma is awarded to the dealer at the end of the course. Financial Director is hoping to take on more dealers in future.

Maggie Burton

Bookkeepers beware!

Stephen Brookner was not a happy man. Somebody had voiced doubts about the Financial Director bookkeeping and accounting package he had helped develop and he wanted to put the record straight. He issued the challenge: 'Find me an accountant who has no computer knowledge and let him prove how simple the package is.'

Brookner was rightly confident. Financial Director is a very simple package to use. It is one of the most well-versed in complex yet fundamental principles of accountancy. And it is this combination which should secure its place in the field of accountancy software for some time to come.

One of the central concepts underlying the Financial Director is that it is a package which is replacing a bookkeeper and indeed the books of account themselves. It therefore incorporates all the principles and skills of bookkeeping and, at the same time, builds in safeguards which prevent the user from making an entry which the bookkeeper would not. Brookner claims that 70 per cent of the program is devoted to preventing simple accounting errors.

It is perhaps an unusual package in that it was developed by taking accounting principles as a base and then building upwards to create a product which could be used in a computer, rather than by adapting computer wizardry to produce a set of accounts.

All this became clear after some time using the Financial Director, but actually getting started was an awesome prospect, particularly for a man who had spent four years avoiding any contact with computers and resisting all attempts by one of the big international firms of accountants to allay his inherent fear of newfangled technology. But once the computer itself was safely installed and the printer connected up, there was really no excuse for further delay. Or was there? It seems there was, because this is the crucial time to sit down and read the manual.

Fortunately the manuals are not too critical with the Financial Director and you can simply leap in and start bashing away at the keyboards. A glance through the manual, however, gives a much clearer idea of what the package can do for you, and how you can set about the task of utilising the functions you need most efficiently.

Functions

The Financial Director offers seven broad functions: cash book, journal, bought ledger, nominal ledger, sales ledger, management accounts and budgets. This is more than adequate for the size of business for which the package is intended.

Setting up the books of account is surprisingly simple. This is, of course, a crucial stage for the user with little accounting knowledge or training. The Financial Director is aimed at taking the drudgery out of day to day bookkeeping — it is not intended to replace the expert financial advice which all businesses require. You are well advised to seek the assistance of your financial adviser if you have any doubts about the type of information needed, the number of accounts or the transfer of balances from a manual system. Once the books have been created the system virtually runs itself, and will produce the financial information and leave an audit trail to satisfy your accountant's needs.

Using the system

The system leads you through the start-up procedures slowly and surely. At almost every stage you are asked to confirm what you have input is correct. Once details about your company — such as name and VAT registration number — have been registered, you then move on to the creation of ledger accounts. If you have the more sophisticated Financial Director II you can also include details of departments.

For the computer novice this user-friendliness is a great advantage. Simple choices and simple instructions given in plain English make it a pleasure to deal with, certainly in the early stages of acquaintance. There is the danger, however, that what is helpful and almost essential in the beginning could prove to be a little tedious and time
The argument against this is, as you process various transactions, the time taken to turn a cheque stub or pluck another invoice from the file will compensate for the Financial Director's occasional tardiness. The argument cannot really be used, however, when you are moving from one operation to another. It was a little tiresome, for instance, when wanting to access the bought ledger to have to go through a series of questions and answers from the main management accounts disk before being allowed to remove that disk and replace it with the bought ledger disk.

As with many packages it is a lot easier to get into a function than it is to get out. However, this is infinitely more preferable to allowing inaccurate accounting to creep in.

A more detailed examination of the operations offered by the Financial Director will give a clearer indication of its value to the businessman.

The cash book is the inevitable starting point for any business and the Financial Director recognises this. All cash transactions can be entered, analysed and automatically posted to the nominal ledger. It also offers the additional and valuable facility of setting up standing order payments for automatic posting on due dates - something the traditional bookkeeper often overlooks. It thus allows the current bank balance to be displayed at any time, and a full cash book listing can be requested whenever you want.

The nominal ledger can also be listed at any time either in full or simply for selected accounts. The listing gives full details of each transaction and also indicates accruals and prepayments at the end of each relevant account. This accrual/prepayments facility is again a bonus, since it allows a much clearer picture of the company's performance to be created. However, as the facility is again a reflection of the traditional double entry bookkeeping of the accountant, you are well advised to consult your accountant before overindulging in creative accounting.

The Journal is the age-old vehicle by which the accountant corrects his errors. The logic behind it is to leave a full explanation of the error, be it a misposting or a misallocation, to show how the error has been corrected and, above all, to ensure that the hallowed principle of double entry is not abused. Following these principles, the Financial Director's journal facility will allow errors to be corrected — but only through a balancing journal entry and certainly not through the cash book. All journal entries are printed out to allow the audit trail to be preserved.

The management accounts include trial balance, balance sheet and profit and loss account. If the budget facility has been used, the appropriate budget figures will be included together with the variance between budget and actual. The management accounts can be produced at the end of any accounting period.

The bought ledger section of the Financial Director provides a comprehensive compilation of all the data necessary to run this essential part of any business. The bought ledger allows full details of the supplier to be retained, together with complete details of transactions, VAT, the discount which might be available to you, the due date for payment and date actually paid. Postings to the nominal ledger are made when invoices are entered. Print-outs of the purchase day book and payment journal are provided as another contribution to the extensive audit trail which the Financial Director offers.

Other print-out options include a complete or individual detailed supplier ledger account listing, remittance advices, due date and aged balance reports and others which are necessary for control of the bought ledger. Cheque printing is also available as an option.

The sales ledger function is equally comprehensive in the details it can retain of a business's customers. Traditional details are incorporated with details of credit terms, normal cash discount balance owing and credit limits. Full transaction details are provided including VAT, date due, discount available and payment received. As with the bought ledger function, a sales day book and receipts journal are automatically printed after each entry session to allow the audit trail to be preserved.

The Financial Director allows instant enquiries to individual accounts and this is supported by the numerous print-outs available, which include a listing of customer accounts, individually or in total, as well as an aged debtor report — an essential element of tight credit control. The report highlights overdue balances and accounts which have exceeded their credit limits, and it can be printed for any specified date. The sales ledger function will also provide customer statements complete with detachable remittance slips.

The budgeting function of the Financial Director is particularly useful and director is particularly useful and will perform a number of tasks which will aid the running of a business. It includes the facility to prepare budgeted profit and loss account, balance sheet and even a source and application of funds' statement — a particularly useful document. Calculation of stocks, trade debtors and creditors and VAT balances is automatic. Budget figures can be entered individually, by automatic period allocation, as a percentage of another or by 13 weekly groupings. The budget figures can be varied to allow the user to assess outcomes under differing conditions. This speeds up this essential technique and will encourage more use to be made of it. The calculation of profit and cash balance by period is automatic and the budgets...
What do you do if your BBC Micro goes wrong?

If you value your BBC Micro and your money you can now purchase extra one and two year full guarantees direct from us or via most Acorn dealers.

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We carry a full stock of parts and should your computer malfunction we will repair it within five days of receipt.

A full one year guarantee costs just £18.40
And a full two year guarantee costs just £27.60

If your Micro is already faulty, and out of guarantee, we will repair it on receipt and issue a full years guarantee for £29.90 or a full two years guarantee for £39.10. Please state fault when sending micro.

For you and your BBC Micro’s peace of mind send the coupon today

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0 I enclose £18.40 for a full 1 years guarantee
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Selling the outside is one thing . . .
knowing the inside is something else.

The IBM Personal Computer is a very special micro. Here is a machine of technical excellence - a standard which others will be measured against. It’s not surprising that such a product demands professional sales and service back-up.

Zynar is well established at the forefront of personal computing. Our network systems lead the field in Europe and the USA - our design group networked the Personal Computer even before its UK debut. We are professionals, having worked for many years in the computing and ‘chip’ industries.

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The Financial Director... themselves will be incorporated in the monthly management accounts print-out.

**Flexibility**

At this stage it is perhaps worth mentioning that there are two versions of the Financial Director, I and II. Financial Director II — which is the version under review — is an extension of the basic package and is more suited to the larger business. It offers the ability to operate more than one company from the same software, and allows a departmental or branch analysis for nominal ledger accounts within the profit and loss range. There is an option of 12 or 13 accounting periods and budgets or management accounts can be printed by department or account number, in details or summary format. It also allows the user to allocate his own account numbering system within the nominal ledger, with up to 800 individual nominal ledger open accounts.

The range of services which the Financial Director offers is, therefore, more than adequate for most small to medium-sized businesses. One notable exception is the lack of sales invoicing and stock control.

The production of sales invoices is a tedious process and one where great time savings can be made. The Financial Director is, however, essentially a bookkeeping package and steers clear of this side of the business. This is not necessarily a weakness in the package. It sets out to provide a bookkeeping system based on the principles of double entry and does just that!

**Expert advice**

In terms of the practicalities of operating the package and utilising its services, it posed no major problems. However, it is very important to take expert financial advice in order to get the most out of your Financial Director.

The budgeting function, in particular, will be wasted if you do not appreciate exactly what you want from it. Used properly it can be a most useful tool for the manager to monitor his business — but a little learning is a dangerous thing and it would be quite easy to get bogged down trying to establish what you really want to do.

Setting up opening balances again will require a degree of accountancy expertise.

The package will not operate if there is a non-balancing trial balance, and a failure to appreciate any error you have made will be most frustrating. It is a pity that the Financial Director does not allow you to make corrections to the trial balance without going through the process of printing out all the balances.

It is most annoying to wait patiently for the printer to sputter out the balances, only for the computer's screen to inform you that the trial balance does not actually balance.

The process has to be repeated following what you hope is the proper correction. It would be more helpful to be informed of this type of error at an earlier stage.

But credit to Financial Director: it is a very polite package and is most gracious when it tells you what a buffoon you have been.

**User friendly...**

Using the cash book is a simple process and the analysis which the Financial Director provides is as much as, if not more than, the traditional manual cash book. Details of the transactions are clear to see and the debitors and creditors analysis is useful to have. As mentioned earlier, the automatic inclusion of standing orders in the cash book ensures that these transactions are not overlooked, and permits an accurate cash balance to be produced.

The creation and deletion of files on both the bought and sales ledger posed no difficulties. The package is designed to lead the user very simply through the system and the instructions are easy to follow. The production of sales and purchase day books allows ample analysis of transactions. But if the Financial Director does not produce invoices, there can be no complaints about customer statements which give details of the month's transactions, an ageing of the outstanding amounts and analysis of how the balance is made up.

The journal is simple to operate and built-in safeguards prevent any misuse and ensure that the all-important audit trail is preserved.

The standard of the accounts which the Financial Director produces is to be commended. Easy to read and sensibly laid out, combined with the inclusion of gross and net trading margins, they allow the business manager to obtain a clear assessment of how the company has performed.

In summary, the Financial Director achieves its objectives admirably. It is by no means a sophisticated gadget on which to perform all manner of weird and wonderful calculations. It is, however, a simple, honest, solidly-based aid to the business manager. Rarely should not be allowed to detract from the package.

To gain the most from the Financial Director, it is important to have an awareness of the underlying accounting principles and techniques which provide the foundation on which the package is built. The appreciation of accountancy is perhaps more important than a knowledge of computers — a point which is perhaps overlooked too often.

**...but slow**

The one criticism which does arise is the apparent slowness of the package once a degree of familiarity has been achieved. The easy-to-answer and follow questions (which are a marvel at the outset) always have to be answered, but perhaps this frustration is justified if it avoids complexity of procedure.

The Financial Director is described by Brookner as the 'accountant in a briefcase' and, indeed, this is what the disk is packed in. It also comes complete with a cassette tape which will certainly assist when starting out, and when browsing through the manual which has been recently updated.

The package will be suitable for most small and medium-sized businesses which require basic accounting records. It could also be used quite successfully by professional firms of accountants or solicitors which need to keep a number of accounts on behalf of clients.

It would seem then that Brookner's challenge was based on a little more than pure bravado. The Financial Director is indeed a staggeringly simple package to operate. Has its user-friendly qualities, saying goodbye when you switch off and it poses no fears for the uninitiated in the computer world. The information it can provide, with regard to the company's cash position, money owed and owing, profitability, long-term potential and cash requirements, is enough to satisfy many budding businessmen who need that information but don't always have the time to collect it.

For a man who had dutifully avoided any contact with computers, the Financial Director turned out to be a great place to work.

**System capacity**

The Financial Director can be supplied for use with any computer capable of functioning under the CP/M, MS-DOS or PCOS Operating System with a minimum of 64k memory. Speed of operation and number of disks depend upon the disk storage available.

The maximum quantities of records of each type permitted by the standard system are as follows:

- **Supplier accounts**
  - 1500
- **Customer accounts**
  - 1500
- **Open purchase invoices**
  - 4000
- **Open sales invoices**
  - 4000
- **Active nominal ledger transactions**
  - 2000
- **Active day book transactions unlimited**

The user can select any combination of maximum data within the limits provided.

**Prices**

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<tr>
<th>Description</th>
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<th>Financial Director II</th>
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</table>

The prices are correct at the time of writing. The all-inclusive prices quoted above only apply if all the appropriate modules are purchased at the same time. Additional modules purchased subsequently are at the individually quoted prices.

Further information from Stephen Brookner, The Financial Director Software, Asphalt House, Palace Street, London SW1, tel 01-928 4377.

PCW 187
Random rumours

It seems that Xerox is short of cash and is looking to sell its Shugart Associates disk drive operation. Details are leaking out on the new Osborne computer. It is expected to offer twice the RAM capacity and storage of the Osborne One, include a 16in display and an optional 8088 add-in card with IBM PC compatibility. A hard disk option may come later. Price is expected to be between $2300-2500.

Victor Technologies is said to be preparing a portable version of its Victor 9000.

Cosmos-Gavilan is apparently about to introduce a portable computer with an 80x80 LCD display and a 5.25in disk drive that will fit inside a briefcase. Sinclair is thought to be working on a business oriented machine for possible introduction this fall. It is expected to have 128K of RAM, a flat screen, micro-disks, to be IBM compatible and sold for about $500.

There are rumours that IBM plans to alter its version of MS-DOS (they call it PC-DOS) so that it will have unique features and limit compatibility by competitors. Digital Research is working on a VMS-like, multi-user, multitasking disk operating system for the National 16032 chip. The DOS will not be related to CP/M. A first for DR1.

There are rumours that now Microsoft has implemented MS-DOS in the C language it will attempt to bring out versions for the Z80 and 68000. Intel is expected to supplement its ROM implementation of CP/M with an implementation of MS-DOS while Digital Equipment Corp is expected to implement its proprietary VMS operating system in ROM. Altos Computer Systems is expected to release a new terminal with a built-in Trackball and using the NEC 7220 graphics controller chip. Integrated software, high-intensity software packages to support the terminals will also be introduced.

Steve Wozniak, creator of the Apple II, is rumoured to be working independently on a project using a new video graphics display technology which will eliminate most of the video support circuitry. It looks like the American National Standards Institute (ANSI) standard for micro-disks is floundering and there will be no standard adopted this year leaving the battle to be fought in the market place.

Data General is at last promising to enter the personal computer market later this year with a 32-bit system. And Prime Computer is also expected to enter the Personal Computer market with a desktop workstation using either the 8086 or 80186. Computer Distributors Inc, Bellevue WA, are rumoured to be ready to introduce the Pick DOS for the IBM PC. The Pick DOS is a business oriented DOS widely used on mini-computers to compete with the Apple Lisa that will be half the price of the Lisa. The Apple Macintosh computer is now anticipated for September or October, cost under $2000 and aimed at schools and home markets. Units have reportedly been in the hands of software developers for several months.

Tandy should shortly introduce the Model IV, replacing the III, with 128K of memory and 24x80 screen. Second will probably be a new colour computer with 64K of RAM and a lower price. And last a portable version of the model III selling for under $1000. Coleco is also expected to introduce a Z80-based microcomputer this summer.

IBM doings

As of the fourth quarter of last year IBM passed Apple Computer in monthly shipments of personal computers. It is expected that by 1984 IBM PC and IBM-like PCs will have grabbed at least 52 per cent of the $3-5000 personal computer marketplace. IBM has also introduced versions of its PC designed to function as replacements for the terminals used with its S/34 and S/38 and large mainframe computers. When used with the S/34 and S/38 the terminal costs $3400 and when used with large mainframes such as the 370s, 30XX and 308X the terminal costs $5800.

At the shack

Tandy has given up trying to market its Colour Computer outside of its own organisation and admits that it was never able to get this marketing effort off the ground. Last year Tandy had signed up RCA to distribute the system via its distribution network. However, only 60 dealers took the product on — with many later dropping it.

The Colour Computer, which was based against the Commodore VIC-20, TI-99/4A and Atari 400, got caught in the competitive squeeze when Commodore, TI and Atari dropped their prices to under $200. Tandy, which markets the unit via its own distributors as well, refused to drop prices or provide the margins sufficient for these independents to compete (see ‘Home Computer Prices Keep Dropping’ below).

Tandy is now in a quandary, limiting its distribution to its own outlets it is losing market share to companies marketing through mass merchandisers such as Sears and K-Mart. The under $200 market place is becoming ever more competitive with very low margins and a great deal of advertising required to yield brand recognition (certainly not the Radio Shack style of doing business). However, by so limiting its distribution it can control selling price and maintain its profit margins.

There are rumours that Radio Shack may pull out of the market with the feeling that the competitors are cutting their own throats.

After the story on how Tandy had adopted Microsoft’s Xenix as its multi-user disk operating system for the Radio Shack Model 16, 68000/Z80 system is now leaking out.

Tandy had introduced the system earlier this year with its single user TRS-DOS Z80-based DOS and promised to release an unspecified multi-user DOS within three months.
Zilog sues NEC

Zilog has filed suit against NEC Electronics charging that they unlawfully copied the Z80 microprocessor and infringed on patents. They allege that NEC copied the Z80 and related chips and Zilog manuals in manufacturing their PD780 and PD780-l microprocessors.

Home computer prices keep dropping

There still seems to be a lot of room for price cutting in the home computer market. I recently saw a toy store newspaper ad for the Timex 1000 (Sinclair ZX81) offered by a mass merchandiser for $59.95 with a $15 rebate from Timex, which means that the customer got the unit for $44.95. There is no doubt that the price for this unit will soon go below $40, particularly when offered with software.

And I recently saw a toy store newspaper ad for the Commodore VIC-20 at $84.95. This appears to be a response to the introduction of the Timex 2000 (see Sinclair Spectrum) and TI 99/2.

It looks like a repeat of the calculator price wars. Thus we can expect eventually to see the Timex 1000 soon selling for $29.95, and maybe even as low as $9.95 with software. We are already seeing the Timex 1000 being used as a premium give-away to purchasers of cars and major appliances.

IEEE LAN standard close

The proposed IEEE 802.3 standard for Local Area Networking has moved a step nearer adoption with the endorsement by 13 key hardware and software vendors. This proposed standard has moved to the next level of approval by the IEEE microcomputer standards committee. From there it goes to the computer standards committee and IEEE standards board for final adoption. If everything goes well we may see it officially adopted by year-end.

The standard conforms very closely to the Ethernet LAN as proposed by DEC, Intel and Xerox. This LAN standard is expected to be used by most high performance LAN systems. It should be noted that IBM and AT&T are known to be working on their own LAN systems which do not conform to the proposed standard. Further, the overwhelming majority of LAN systems already installed are of the low and medium performance type where nothing approaching standard exists, and in fact the situation may be termed chaotic.

Unix update

The implementation of Unix on 68000-based micros appears to be split evenly between two different implementations. Xenix from Microsoft, Bellevue WA, and UnixPlus+ from Unisoft, Berkeley CA. There are a few vendors who have done their own 68000 ports but it is likely that they will switch to either Xenix or UnixPlus+ to achieve some level of compatibility and a wider market base, since there is already some software available for these systems. UnixPlus+ was the first port to reach the market and implements the Berkeley version of Unix which accounts for its popularity. Xenix on the other hand is an implementation of the Bell Labs version of Unix and comes from one of the largest micro software houses in operation today (namely Microsoft).

The 8086 and Z8000-based micros appear to be going with Xenix. The only other alternative here is Coherent from Mark Williams Co, Chicago, and they have not been aggressive in getting their product out.

National Semiconductor has already demonstrated their Unix implementation and one made by Human Computing Resources, Toronto, Canada. The initial results do not indicate that this implementation is any faster than the 68000, 8086 and Z8000 implementations despite the claim by National Semiconductor that this micro has been specifically designed to support Unix. The initial demonstrations of the product, however, are still considered prototypes and tuning should improve its performance.

IBM PC News

IBM has released an upgraded version of the PC (called the XT) with a 10Mbyte Seagate hard disk, Zebec controller and larger power supply. IBM took advantage of the chance to also change the printed circuit board to utilise the new 64k RAM chips so that now 64k is the standard minimum RAM size for the PC. Also the number of expansion slots was increased from five to eight and the dual-sided floppy disk capacity was increased from 320k to 360k per drive. IBM also increased the price for the basic unit (less hard disk drive) from $1265 to $1355 (following in the footsteps of the Apple IIE). The unit is $40 less than the Apple IIE and only a few bucks more than the new TI IBM PC compatible system.

IBM also finally started selling the Color CRT display they began showing at Comdex last fall. IBM is also offering its dealers a communications interface which will allow them to interact directly with the factory via phone, by-passing the US mail service. The likelihood is that they will make the p-System available for $50 for the run-time system.

Video disk-based games expected

As early as this summer we can expect to see the appearance of the first video disk-based computer games. Using video laser disks these games are expected to appear first in the games arcades with home units to follow within another year or two. One such prototype unit was demonstrated at the Consumer Electronics Show, held last January.

The basic problem of slow access time (it can take as much as ten seconds to move from one frame to another with a typical access time of five seconds) is currently being attacked by developers. One technique proposed is to use two disk players in a game unit. This is feasible since the players are fairly low in cost.
IBM will soon offer this interface to customers, too.
At the same press conference at which the XT was introduced, IBM also unveiled new models of the 3270 CRT terminals designed for use with the mainframes. One of the models can also function as a stand-alone personal computer. Further, another model uses the gas-plasma display shown at last year's NCC show. This significantly reduces the depth of the terminal.

Rumours are still rampant that IBM will soon introduce an 8086 or 80286-based system and low-cost consumer oriented system. A Stamford Conn, market research firm (Gartner Group) predicts that this year IBM will sell 500,000 PCs. If we add to this this year IBM will sell 500,000 PCs. If we add to this

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Rumours are still rampant that IBM will soon introduce an 8086 or 80286-based system and low-cost consumer oriented system. A Stamford Conn, market research firm (Gartner Group) predicts that this year IBM will sell 500,000 PCs. If we add to this another 200,000 to 300,000 IBM PC compatible systems made by other companies, then the operating system and disk format used here may finally establish a de facto standard in the 5.25 inch disk market that will ultimately challenge the 8 inch CP/M standard.

Home computer price wars
TI and Commodore are going through a new round of price cuts for the home computer — an action that Tandy has called 'cut-throat'. Both companies slashed $50 from the price of their already 'slashed' prices for the TI 99/4 and Commodore VIC-20 bringing selling prices down to the $130 level.

Atari, in an attempt to be competitive, introduced an 'under $90' keyboard add-on for their 2600 video game system to convert it into a low-cost 'home computer'. This has been seen as a defensive move since the low-cost personal computer appears seriously to have impacted the sales of video game units. Atari also recently introduced a $55 rebate for the Model 400 to effectively lower its price to just under $200. TI and Commodore broke the $200 barrier five months previously.

TI recently introduced its 99/2 computer with a dealer cost of $75. Tandy is expected to introduce a new lower cost colour computer to replace their current unit which has a $299 price tag. There are rumours that the unit, made in Korea and costing $150, should appear soon.

Atari, in an attempt to reduce manufacturing costs, laid off 1700 workers and shifted a large part of its video games and personal computer manufacturing to the Far East.

Super-microprocessors — a status report
National Semiconductor demonstrated its 16032 system recently at a Unix conference running a port of Unix done by Human Computing Resources Corp, Toronto. Further, it has been accepting orders for the chip set promising production quantities this summer. The company has been shipping sample quantities for several months. Thus we can expect to see initial shipments of 16032-based systems before the end of the year.

NS is expected to start shipping their 'Mesa' system this fall. The Mesa, an 8-user system, is expected to contain the 16082 memory management unit with a 32-bit wide virtual memory. NS is promising to start sampling its floating point co-processor chip this month.

The 16032 is reported to be really a 32-bit processor with 16-bit I/O. The 32032, which NS says it will begin sampling in the fourth quarter of this year, is reported to be an upgrade of the 16032 with true 32-bit I/O. Further, NS claims that it will be possible to build a fault-tolerant transaction system by running two 32032s in parallel and comparing results on alternate memory cycles to detect soft errors. NS says the 32032 will be 1.8 times faster than the 16032.

The Motorola 68000 although doing many operations — 32-bits at a time — has an internal 16-bit wide data path and hence the redesign task to move up to a 32-bit version (68020) is a more difficult undertaking for Motorola vis-a-vis National. The 68020 is being promised for April '84 (samples) and August '84 (production). This will be Motorola's true 32-bit micro operating at 16MHz. It will do 32-bit multiply/divide. The device will use 150,000 transistors, consume 1.5 watts and have approximately 100 pins.

The Motorola 68881 floating point co-processor production schedule has slipped and Motorola is now promising samples in July '84 and production quantities in December '84. It will contain eight 80-bit registers, have all the addressing modes of 68020, be compatible with the IEEE floating point standard plus some additional functions.

The Motorola 68010, its 16-bit micro with virtual memory facilities, is now being sampled and production is expected this summer. The maximum clock speed will be 16MHz.

A crimp was thrown into Intel's 286 project and 32-bit upgrade when a large group of engineers upped and left their Portland OR operation to form a Unix systems house based on Intel's technology. However, Intel is already shipping limited production quantities of the 80286.

The NS 16032 will compete with the Motorola 68010 while the 32032 will compete with the Motorola 68020. Samples of both the 16032 and 68010 became available at about the same time with NS promising earlier production quantities. It appears that NS may be sampling and producing the 32032 well ahead of Motorola's 68202. Thus although National was very late entering the super-micro marketplace it appears that it now has a good opportunity of garnering enough to be worthwhile.

Further, Digital Equipment Corporation is rumoured to have given its 'VAX-on-a-chip' program top priority and NCR is expected finally to become available and will we soon see 432-based systems being introduced.

Intel text co-processor chip
Intel has announced an IC (82730), to operate in conjunction with its 8086 16-bit micro, that provides word-processing display functions such as proportional character spacing, smooth scroll, display of superscripts and subscripts, variable fonts, allows users to define their own character sets and provides complete corres-

One last note is that the new 32-bit micros are expected to be implemented in CMOS to reduce the power consumption and heat dissipation of these devices.
YANKEE DOODLES

PCN vs LAN

Manufacturers have been fighting among themselves for several years now to develop a standard for Local Area Networks (LANs) with little or no progress being made. In the meantime Personal Computer Networks (PCNs) have moved into the market. The PCN interconnects a small number of personal computers allowing them to transfer data and share peripherals such as high-speed printers and large capacity hard disks. When a personal computer is used as part of a PCN it is referred to as a 'workstation'.

Although lower performance than the LANs, the PCNs are now threatening to overshadow the marketplace. Strategic Inc, San Jose CA, a market research firm, estimates that nearly 12,000 PCNs were installed up through the end of last year—compared to only 800 baseband and broadband LANs. Further, it predicts that by the end of 1987 there will be 110,000 PCNs.

This trend is apparently due to the fact that most installations include only a small number of workstations (typically six or less), use lower data transfer rates and have less traffic, and hence high performance is not required. Also, some PCN makers offer interfaces to allow the PCN to serve as a gateway into an LAN. The problem with PCNs are that there is no established standard and interfacing different peripherals may be a problem.

Low cost PCNs ($300-500 per station) typically use either twisted wire pairs or coaxial cable to interconnect devices transmitting data at anywhere from 800k to 2.5 Mbits per second (bps). A single personal computer or special interfaces may be used. In higher performance, higher cost ($typically $2000 per station) PCNs coaxial cable is used with controller/transceivers at each station.

Japan in US market

Nippon Electric (NEC), a $6 billion a year company which dominates Japan's personal computer market, entered the US over two years ago with a modest marketing effort. They now claim to hold 3% of the 16-bit micro market, which is roughly 20 per cent of IBM's share and close to 30 per cent of DEC's share. IBM and Epson both entered the US market last year with 8-bit and portable machines.

Japan has proved that it can build good machines and is committed to long term investments in establishing its position in the marketplace. However, it has met with problems. The rapid pace of change and the innovations introduced by American competitors have proved a formidable challenge to the Japanese whose products are generally unimpressive.

However, it was only two years ago that US IC memory and printer makers were boasting that they would outmaneouvre and outproduce the Japanese. However, manufacturing and quality control problems in these two markets created opportunities for the Japanese. Using conservative technology and improved manufacturing techniques they now dominate these markets. The Japanese are now attacking the floppy disk and hard disk markets with the same techniques. It is likely that they will attack the segment of the personal computer market that is less innovative and use older technology with success. For example, a portable 8-bit microcomputer, such as the Osborne, is an ideal candidate for Japanese competition.

Offshore manufacturing

American microcomputer and component manufacturers are moving their manufacturing facilities outside the US to maintain their competitive positions in a marketplace that is becoming increasingly more price competitive. They are setting up plants in Taiwan, Singapore, India, Mexico, Puerto Rico, Brazil and France.

The auto computer

At a recent automobile show in New York City, Ford showed a prototype car called the Concept 100 that is slated for introduction next year.

Among other features it sported a touch-sensitive 5 inch CRT built in to the dash and a Z80 CPU. General Motors showed a prototype of its 1995 Buick Question with a flat screen built into its dashboard.

Quotation of the Month

"I am not an Atari Democrat." Alan Cranston, announced candidate for President.

No business like show business!

The Comdex Fall Computer Show now claims to be the fastest growing show (of any kind) in the country. Its last show exhibit space almost doubled and attendance increased by a whopping $125 per cent. The only larger computer show is NCC (National Computer Conference). NCC and Comdex Fall are so large that there are few convention facilities that can handle them. The Las Vegas Convention Center, believed to be the largest single-floor hall in the country, is already too small for the next Comdex show and it is spilling over into two other hotels.

Random bits

Later this year Harris Corp plans to introduce the CMOS version of the Intel 8086 and DEC PIP-11... As Sinelair/Timex have now introduced the Spectrum/Timex 2000 in the US, one wonders when they will introduce the microdrive and RS-232 add-ons for the unit that they have been advertising, but not delivering, in the UK for almost a year now... The IEEE 796 Bus (Multibus) Standard has to be adopted by the IEEE and is now an official standard. Also, the IEEE expects to shortly adopt the Binary Floating Point Arithmetic (IEEE 754) and Assembly Language Memonics (IEEE 649) standards... For those into country and western music check out the record titled Basic Ain't the Language of Love. It tells the story of a woman involved with a personal computer addict...
Don Beal is not an entrepreneur or a supplier of micro-chess computers. He's a lecturer in the computer science department of the University of London's Queen Mary College. There may come a time, if all goes well with his research, when a Beal chess computer will come onto the market place. But that would be more or less incidental to his real interest, which might be described as the theory of computer chess programming.

I almost met Beal last September when he was due to enter the PCW tournament. His program was then running on a mainframe computer and he was struggling to transpose it to a micro. On the opening day of the tournament there was still some slight possibility he would succeed by the start of the third round. But he didn’t. It was a great pity, since his presence would have considerably strengthened the amateur entry.

Among the computer science and artificial intelligence communities a certain dabbling in the problems of chess programming is fairly common. But Beal is unique in that his daily work as a lecturer — as well as his research — is concentrated to a large extent on computer chess search theory.

How did this come about? Beal learned his programming skills working for the Ministry of Defence before joining Queen Mary College. He played chess as a schoolboy and was reasonably enthusiastic about it — making the school team, and winning the school championship. When he went to university, however, chess quickly came to seem merely a way of wasting valuable time.

At the MoD his work with computers led to an interest in the potential of artificial intelligence. ‘It occurred to me that chess would be an ideal field; a nice, limited problem with which one could investigate some aspects of AI. In fact, as I got into it, it turned out to be a huge problem,’ Beal recalled.

He began a doctorate on computer chess, which he still brushes the dust off from time to time, and hopes one day to finish. And, since some portion of his teenage years had been spent mastering the secrets of electrical engineering, a few years ago he began to build micro-processor boards to turn his theories into practice.

Most of the material that he works with is a closed book to me, and minimax search theory is not something to be picked up lightly in the course of an hour’s chat over coffee. So those of you who have wondered from time to time how the machine does it when it nicks your rook unexpectedly, won’t be much wiser by the time you finish reading this. That topic is one we will return to in another column another day.

Part of the problem is that the language used by Beal and his colleagues to talk about games theory bears a misleading relationship to English. I thought I followed reasonably well, for instance, when he explained his job at Queen Mary College. It involves, he said, some research into minimax theory, particularly the question of why it is that look-ahead systems result in better moves being played by the computer. ‘For many years now look-ahead has been known to be effective in practice, but people have not made much progress in explaining in a convincing way, at the theoretical level, why this should be so.’

When he’d finished saying this, I nodded wisely and confessed to being totally baffled. Beal, it seems, has produced a reasonably convincing theoretical argument which does provide such an explanation. ‘Does it mean there will be better chess computers?’ I asked. ‘Not really,’ he said. ‘It just explains why doing the things they are doing already produces reasonably good chess-like decisions.’

One piece of theory which might be of interest to readers new to this sort of thing did emerge from our chat. There is a well known algorithm in chess programming which saves a great deal of time without any risk that the short cut it produces will lead to the machine overlooking some vital move. It is called the Alpha Beta algorithm.

‘The algorithm involves the idea of accumulating ‘bounds’ as the search pro-
ceeds. As the program moves through the search tree, it locates a worst move sequence for white, and a worst move sequence for black. When you find this, there is no point in looking any further for an even worse sequence. Instead the program stops looking at move possibilities once they equal this value. In other words, it sets a bound or a limit on the search. At any moment in the search then, you have a best and a worst possible bound,' he explained.

The advantage is that where a standard search algorithm will go on to look at every possible move, using the Alpha Beta algorithm will save a very precisely definable proportion of search time. At its best, the algorithm will reduce the number of possible moves looked at (or search nodes, as they are called) to the square root of the number of moves that would otherwise be looked at. On a search sequence that would normally look at a million moves, for example, it will result in a thousandfold improvement (ie, the program will only need to scan 1000 instead of 1,000,000 search nodes).

How well this theory translates into practice can be seen in the games section where one of Beal's program victories can be studied at leisure, together with David Levy's comments on it.

Beal's own micro is still in the assembly stage, and when I spoke to him, he thought it would need a month or two's 'uninterrupted work' to be brought to full tournament strength. The heart of the machine, Beal says, is a piece of fast sequential logic. 'This bit of hardware is what makes it different from the Thomas Bell hardware (Belle). Belle is a huge piece of hardware. Its inventor calls it portable, but it weighs about 60 pounds and you have to be dedicated to carry it about. My machine is about the size of the usual hard cover book and it will have around one quarter of Belle's search speed,' he explained. ('One quarter might sound like a modest development, but it should be enough to make Beal's machine an absolutely formidable opponent. It would give it a much faster search speed than any of the current commercially available micros.)

Beal has used some very expensive chips in the construction of his machine, and working on the usual rule of thumb that a retail version should cost four times the component price, it would be priced out of the range of all but the wealthiest chess enthusiasts if it ever came to the marketplace.

At least, that is what he thinks at the moment. But if it ever gets out of its academic environment it might well find a businessman to get the production lines rolling and the prices down.

**Games section**

White: BCP; Black: 'Strong player on an off day' Sicilian Defence: Notes by David Levy

1 e2-e4 e7-c5
2 e2-e3

(This move has become extremely popular in recent years. Its chief merit is that it avoids the volumes of openings theory that have been written about the Sicilian Defence, but it must also be said that the move c2-c3 is not so easy to meet as might first appear. White threatens immediately to establish a powerful pawn centre with d2-d4.)

1) Nf3-f6
2) e4-e5
3) d2-d4 c5xd4
4) Bf1-c4?

(An interesting gambit. White offers a pawn in return for a lead in development.)

5) Nd3-b6
6) Be4-b3 dxe3
7) Nb1xc3 e7-e6

(Blunting the attack along the b3-f7 diagonal.)

8) Ng1-f3 d7-d5

(This move may be playable, but I think it possibly premature. I would have played ... Bb8xe7, followed by ...0-0, and only later try for ...d7-d5.)

9) e5xd6 e.p.

(This en passant capture leaves White without the cramming influence exerted by his pawn on e5, but in return it (I almost said he) develops a strong initiative.)

9) Bb8xd6
10) 0-0

(Black was worried, with good reason, about the possibility of an eventual Nc3-b5 by White, but the text wastes too much valuable time, and allows White's initiative to grow even more dangerous. Better would have been 10...Bd6-e7, or 10...0-0, or 10...Nbd8-c6.)

11) Bc1-g5 Qd8-e7?

(Black should have played 11...Bd6-e7, and if 12 Bg5xe7 Qd4xd1 and 13...Kxe8xd7, with an extra pawn and few real problems. Note that after 12 Bg5xe7 Black cannot recapture with the queen because of 13 Qd1-d4, forking the pawn on g7 and the knight on b6. This theme recurs again during the game.)

12) Ra1-c1 Nb8-e6
13) Nc3-e4 Bb6-e7

(Black was by now torn between the devil and the deep blue sea. The other retreat, to f8, would have left White with such a commanding lead in development that it would have been extremely difficult for Black to survive. Nevertheless, that is the course that I would have followed, because now Black loses castling rights for good.)

14) Bg5xe7 Qc7xe7
15) Ne4-d6+ Ke8-f8
16) Rf1-e1 g7-g6

(Hoping to escape with the king at g7, but he should have tried ...h7-h6, possibly followed by ...Kg8-g7 and ...Kg8-h7.)

17) Nf5-d4 Ne6-a5
18) Nd4xe6!

(For the first surprise. White wins back the pawn with a little combination.)

19) Bc8xe6
20) Qd1-d4 Rh8-g8
21) Bb3xe6 f7xe6
22) Re1-c7!!

(Simple and decisive. If Black captures the rock, White's queen comes in on f6, forcing mate.)

21) ... Nb6-d7
22) Rc7xd7! Black resigns

(And the capture of Black's rook allows 23 Qd4-f6+, with mate next move. A convincing display by White, fully justifying the pawn sacrifice in the opening.)

**A short apology**

Before my post box is crammed with letters pointing out that Hegener and Glaser do not make a machine called the Roman II or even the Roman III, let me explain how these mysterious machines came to find their way into last month's column. Some thirty lines of copy were added to the article rather late in the day. I painstakingly read these lines out to a kindly colleague down the other end of the telephone line. To make sure that no mistakes occurred over the phone I said, when I came to talk of the Mephisto III, '... the result, in the Mephisto III's case... that's Roman iii, not arabic, got it?' 'Yes', said my colleague, and wrote: 'The result in the Mephisto and Roman III's case is that it now plays a very intuitive game.' Those of our readers with sharp eyes and long memories will have noticed that the same fate befall a comment made on the Mephisto II a little further down the column. May we respectfully hope that those of you who fell off your chairs laughing at us didn't bruise yourselves too badly!

END
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SEE US ON STAND 30 AT THE INTERNATIONAL WP EXHIBITION WEMBLEY
LESSON IN LOGO

Dick Olney went back to school recently. Here he reports back to us on the latest educational tool, the programming language Logo.

Being a fairly recent convert to Seymour Papert’s ideas regarding the use of computers in schools, I was excited to find his book on the use of Logo, which provides an educational tool presented by Papert as an educational tool for children how to think, indeed how to think naturally. He argues that the emphasis of teaching practice, but which provides an educational tool which can only be utilised with an approach which teaches for natural learning, which can only be counterproductive and in no way reflects the reality of an individual’s cognitive potential. He argues that the emphasis of the child from particular areas of study, not least because the facts presented frequently have little applicability in the child’s everyday life. Children, after all, have a powerful facility for natural learning, which can only be utilised with an approach which teaches them how to think, indeed how to think about thinking, regardless of subject matter.

The programming language, Logo, presented by Papert as an educational tool which is not merely an extension of normal teaching practice, but which provides an entirely new learning environment where traditional relationships between teacher and child are radically changed. Fundamentally, the learning language is ‘turtle’ geometry. By giving the turtle (a small screen based creature) commands such as forward, right, left, etc., simple shapes and patterns can be designed. Useful routines are defined as new commands (much like Forth) which are then combined to produce complex programs. These programs can then be easily debugged because they are reducible to readily comprehensible ‘mind size bites’. Throughout all this, children are able to predict the outcome of a series of commands by putting themselves in the position of the turtle (playing turtle). This active association between the child and the turtle is in direct opposition to the endless repetition of times tables, so commonplace in the classroom procedures, and as such less threatening to the teachers concerned. For these reasons there can be no doubt that, in this country at least, Logo will initially be implemented in this way.

My disappointment at the lack of Seymour Papert was offset to some extent by the presence of the delightful Cynthia Solomon, one of his closest associates. Cynthia — along with many of the original Logo researchers — is now working at one of the Atari research centres in Cambridge, Massachusetts. She was at the conference to demonstrate a pre-production version of the forthcoming Atari Logo, which should be available in the autumn. This implementation makes full use of the Atari’s player and cassette capabilities (there are four turtles!), giving rise to one of the Atari Logo’s most interesting features, that of collision detection. Background procedures, called ‘when demons’, can be set to activate on detection of any one of a variety of collision conditions. Incidentally, the coming Acorn Electron will feature Logo, and versions are also being produced for the CBM VIC 64 and Sinclair Spectrum machines, but these are unlikely to be on sale before next year.

I should note that Logo is, of course, old hat to Cynthia, who is now working on a language called Gesture. She was not over-fORTHCOMING on details of her work.

But from what I can gather, Gesture is, as you might imagine, a language which works by direct perception of body movements. Quite how it distinguishes meaningful movement from peripheral activities, such as nose picking or thumb sucking, I can’t imagine, but I’m sure all will become clear in the fullness of time!

Although Logo undoubtedly emerged as the favourite language at the conference, it was by no means the only language presented. The antecedent of all AI languages is Lisp, an introduction to which can be found in the May issue of PCW. POP II was also discussed. Logo itself is written in Lisp, as is the other main language featured over the weekend — Prolog.

Prolog differs from most programming languages in that it is "declarative", rather than 'procedural'. The following extract from a paper by Robert Hawley of Plymouth Polytechnic summarises the basic principles of Prolog: Prolog provides an easy way of specifying particular types of program in terms of the rules governing the problem rather than the procedure needed to solve the problem. The procedure is embedded within the Prolog system and each program makes use of it implicitly rather than explicitly.

Prolog certainly does hold a great potential for educational use, though descriptions of its power varied from the language of God (Richard Ennals) to ‘pretty neat’ (an American). The ‘main man’ with regard to Prolog emerged as Professor Robert Kowalski (language of God school) who also, as it turned out, was the most powerful speaker at the conference, in style if not in content. The name Prolog is derived from ‘programming in logic’ and its importance for Kowalski derives from its use as an instrument in introducing formal logic to the school curriculum. My own feeling is that ‘formal logic’ is about as useful in real human decision making as differential equations, and has little or no applicability outside the academic environment. Presumably, however, Professor Kowalski spends most of this time inside the academic environment where logic is protected from the more unpredictable elements of the human psyche.

One point on which everybody agreed is that Basic, as a language, should be discarded immediately. Basic may or may not have its uses, but as a first programming language it is confusing and inadequate, not least because it’s so difficult actually to do anything worthwhile with it, without a lot of effort. Before long the computer manufacturers will realise this, and I predict that the language will become an historical curiosity within the next five years!

Footnote

Intelligent Educational Computing, an overview of the AI approach to educational computing, by Mazoud Yazdani will soon be available for £15.50. It can be ordered now from Ellis Horwood Ltd, Market Cross House, Cooper St, Chichester, W Sussex.

Two summer schools on Logo programming are to be held in July and August at Edinburgh University. Details from K R Johnson, The Logo School, Dept of AI, Forrest Hill, Edinburgh, tel (031) 667 1011 ext 2556.
ACCOUNTANCY AID

Alan Secker analyses the businessman's accounting requirements and assesses the instrumentality of accounting software in simplifying his workload – in terms of time and cost saving. We present (in an edited version) his comprehensive questionnaire which throws some light into this dark corner.

Now that I have a computer, shouldn't my accountancy bills go down? How often have I heard that?! The plain fact is that the one need not follow the other as sure as night follows day. It 'depends'.

Microcomputer accounting software at present often possesses many glaring deficiencies. Glaring, that is, if you have already learnt what to look for. It is these deficiencies that add to – rather than detract from – the burden of your accountant and/or your auditor. It can also affect the time it takes and the number of queries asked of you by the VAT Inspector when he examines your records.

Some of the problems may be overcome by improved procedures; some by changes in the software, but some, you will have to accept as a trade-off against the benefits of a computer system, namely:

- speed
- arithmetical accuracy
- efficiency
- reliability

Cash book

The concept of the 'cash book', so long ignored by suites either imported from the United States or rewrites of the same, has for some time been banished to a wilderness. It is now beginning to return. For example, Microshade have one. For those that do not know, the cash book is the document that records the ins and outs of your most active bank account, normally your current account. For any given period it will disclose:

(i) The balance at the commencement of the period (ie, in hand or overdrawn)
(ii) Receipts (sums received) from customers (sales ledger)
(iii) Receipts from other sources (nominal ledger)
(iv) Payments to suppliers (purchase ledger)
(v) Payments to non-suppliers, for example, wages cheques, (nominal ledger)
(vi) The balance at the end of the period.

The reason that there is no direct equivalent to the cash book is primarily due to the way accounting software is constructed. It is invariably sold in encapsulated modules each corresponding to a different ledger. For example, if you were to acquire a sales ledger package, then it would (see note 1) contain a cash received routine which would only deal with receipts relating to the sales ledger. Thus the sales ledger package will happily accept receipts from customers, but if you were to deal with the repayment to a customer, for example, in respect of a return of goods, you would have to deal with this under a completely separate routine (see note 2). The same problem arises with the purchase ledger, and so there are two cash transaction reports in respect of each ledger plus an opening and closing balance that represent the cash book for any given period, not an easy concept to hold in one's mind.

Very few packages draw these components together to produce a cash book. Even if they do, is it in a useful form? Before answering that question, let me tell you what answer you would get from a software vendor if you mention the absence of a cash book. His reply would be 'but the information is in the nominal ledger'. To some extent that is true. The totals (if you are lucky) from each of the six sources mentioned above, should have found their way to the bank account as part of the nominal ledger but in no way can you go directly to the cash book to find...
Cheque numbers

In the perfect system, only one cheque book should be in use at any time. This means that cheque details are introduced to the system, they will be sequential. In a manual system one can tell 'at-a-glance' whether a cheque is missing from a sequence and, if so, the auditor will invariably enquire as to why. Indeed, experienced bookkeepers will usually enter the details of a cancelled cheque as a NUL line stating that the cheque has been cancelled, rather than incur the possibility of later time-wasting in answering the auditor's inevitable question. In the computerised system, an undisciplined user is going to have cheque numbers all over the place. He may pay suppliers throughout an accounting period (month) interspersed with wages cheques, PAYE cheques, etc - the net result being that an audit check is going to be slow and laborious.

The only kind of package that can handle this situation is one that will allow entry of cheque payments regardless of destination and similarly of receipts. So far I haven't found one that will run on any of the machines with which I am familiar.

Solution

Before giving a possible solution, let me give you a cardinal rule about purchase ledger systems. If a transaction generates an invoice or its equivalent (rates demand, for example), then pass it through the purchase ledger system. The benefits include:

(i) All such bits of paper will be filed in one place (purchase invoices file);
(ii) There will all be reference numbers in the purchase journal and, hopefully, the same numbers will be written on the documents themselves thus making them relocatable; and
(iii) Most of your payments will be to suppliers in settlement of such bills and what payments are left will not be numerous 

Bank reconciliations

The method for proving that one's bank transactions are properly recorded is to compare them item by item for the period under review with the bank statement, and to make a list of all the differences. The differences should all represent transactions which although being revealed on succeeding bank statements had not been processed at the last date on the statement in hand.

In order to check the bank statement, you now have to check it against six possible sources of data; two from the sales ledger, two from the nominal ledger, and two from the purchase ledger. This assesses that you have only done one posting run during the period in hand. If you have done more, then you have to multiply the number of documents you have to check from. True, if you have implemented the two cheque books' approach, the payments will be relatively easier to locate but what about the banking?

Bankings

On any day when you pay a number of cheques into your bank, you probably enter them on a single paying-in or bank giro credit slip. However, when you come to enter them, most may be from customers and destined for your sales ledger; the remainder being for your nominal ledger. When you eventually get your bank statement, the figure you will see for that day's lodgements will be the same as the total of your paying-in slip. But that figure will not appear in your accounting records!

How, then, do you handle the reconciliation of bankings? The answer is 'with difficulty'!

Solution

Clearly the answer must be analogous to the solution for the payment side. You should either separate paying-in slips for suppliers' cheques (sales ledger) as opposed to non-suppliers' cheques (nominal ledger) or, alternatively, use completely separate paying-in books but mark them clearly.

This in itself does not necessarily solve the problem. If you are entering the transactions of, say, several days' bankings, you may find that the routine used will not allow you to subtotal the transactions for any day before going on to those for the following day, and as a result you will simply obtain one single total for the whole period (say, a month). This means that again you have no figure from your accounting system corresponding with the receipts side of your bank statements.
Maggie Burton reviews a software package that enables you to design and compose your own brainteasers.

Some people like to solve puzzles. Others who are a little more clever prefer to make them up for friends and family to solve.

Crossword Magic will help those smart puzzle-setters to design their own crosswords. It doesn't pretend to help you invent clues or get the grid symmetrical as it should be (incidentally, how many newspaper crosswords these days are symmetrical?), but it's far easier than drawing crosswords out by hand. What's more, it's entertaining and could even encourage people who'd never thought of it before to dig out their dictionaries and start inventing puzzles to mystify and enlighten everyone.

It runs on an Apple II with DOS 3.3 and comes on a double-sided disk. Side one is the crossword maker and side two is the player. In the process of making, storing and playing one puzzle, much opening and shutting of drives and turning over of disks goes on. This is a little irritating sometimes but is infinitely preferable to cassettes.

The program is attractively packaged in a hard, plastic-coated booklet containing disk and instructions. This is a good idea as it keeps disk and documentation together in a format which is hard enough to protect the disk and at the same time easy to store.

After switching on the Apple and showing the disk in drive one as usual, a display of the program name and author appears for a few seconds and then vanishes, throwing you into the middle of the main crossword maker menu. At this point, if you haven't read the instructions, you should do so - although the program is very friendly to use.

Seven options are provided by the main menu. One of those is that of the existing program; another is to delete a crossword. Then there's 'create puzzle', 'edit puzzle', 'print puzzle', 'transfer puzzle' (ie, move one to another disk) and 'complete puzzle'.

**Procedure**

It's logical to begin by explaining how a crossword is made. This is naturally initiated by choosing the 'create puzzle' option from the main menu. The first step is to size your crossword. It needn't be square although it must be rectangular. The program defaults to a 10 x 10 square if you decide to use automatic sizing. Once this has been done the program draws a grid on the screen and you can start to enter words onto the grid.

Words are placed on the grid simply by typing them in and pressing 'return'. The program then locates them in one of (usually) several possible locations. The first word to be entered is always put at the top left hand side of the grid, beginning in the far left corner. Once you have entered a few words you can juggle the whole lot around using control-R (relocate). After you have entered more than about six words (depending on the size of the crossword), you lose the ability to juggle the words around. Only the 'object word' (that which has just been entered) may be moved.

It is here that Crossword Magic's big disadvantage comes to light. It is impossible to delete any word apart from the object word. Now, it is obvious that deleting one word from a puzzle means also deleting all words which connect solely with that word. You'd need some very skilful programming to get a computer to work that one out for you but

![Crossword Grid](image-url)
is would be possible — and very helpful.

It's a good idea to fill the grid as much as possible with longer words first and then type in smaller words towards the end to fill in the gaps. Of course, you are supposed to fill in as many squares as possible but at any time you can stop entering words and begin composing clues.

You may also abandon your clues and return to entering words. These functions are performed by pressing the escape key to view options. Options are easy to understand and need little explanation.

Clue entry is very easy. The word needing a clue is highlighted and the clue typed in and entered. This is done in the same order as that in which the words were input in the first place. When you have finished entering clues, you are given the option of reviewing them and thus correcting any mistakes you have made.

All in all, composing your own crossword is very absorbing. Using a dictionary as an aid in choosing words and inventing clues is not only helpful — and a bit educational — but it can also help make clues a little more difficult to solve. You'd be surprised how many people don’t know the exact dictionary meaning of some quite common words. While constructing your teaser, you may also select one of four display options for the grid using control-B. These are as follows: words can be enclosed in square boxes (rather like an Othello board), blanks can be filled in with fine chequered shading on top of the boxes; you can have no boxes and just shading or neither, making for a very confusing crossword!

At any stage in the design of a puzzle you can stop, save what you've done (as an 'incomplete' file — with the extension 'inc') and pick it up later. Should you be in danger of losing what you've done, the computer can have no boxes and just shading or neither, making for a very confusing crossword!

PCW welcomes approaches from would-be writers, even those who have never appeared in print before. In this game it's often those with practical experience who have important things to say so we don't mind if your prose is less than perfect — providing submissions have a sensible structure and follow a logical sequence, we can take care of the polishing. If your article is already written, send it in — taking care to ensure that your name and address are on the front page. We prefer (basically, avoiding promposity awkward indeed if the same article appeared another magazine — it would be very unprofessional) to list all the puzzles on that disk, assign numbers to them and ask you to type in the number of the puzzle you want.

Actually playing a puzzle is a bit confusing at first. The left and right arrow keys move you around the grid from one square needing a letter to another. The space bar toggles you between across and down. As you move from one word to another, the clue for that word is displayed below the grid on the screen. Changing from across to down where two words meet also changes the clue.

The disadvantage, however, is that you can't delete your input. You can overwrite but it's confusing to have filled squares wrongly and to be unable to delete what you've filled in. When you've finished doing the crossword, the computer tells you your percentage score. You can also stop halfway through doing a puzzle and save your progress, using your initials as an extension.

Conclusions

Crossword Magic is a lot of fun to use. Because it is the sort of fun software which lasts and lasts, the price of £24.95 — though it may seem pricey at first — is really justifiable.

As with all software, it has its little idiosyncrasies — the lack of an ability to delete, for instance, but it is logically designed and easy to learn. One or two good readings of the instructions are all you need. It's the sort of program which will go down well on family computers — for children it does, in a way, provide Crossword Magic.

Crossword Magic is directly available from Micro City Ltd, PO Box 54, Norwich NR2 1SZ. Tel (0603) 25648.

To play a puzzle, the player software is loaded and you are then asked to insert the disk containing the puzzle you wish to play (followed by return to signify that you're ready to go ahead). The program will then list all the puzzles on that disk, assign numbers to them and ask you to type in the number of the puzzle you want.

If you have an idea for an article or a series, write us a letter outlining your ideas. A one- or two-page synopsis giving the proposed structure, sequence and content is what we're looking for. But before you send anything to us, take a good look through PCW to see what sort of articles get published and to get a feel for the style of writing we prefer (basically, avoiding promposity at one extreme and flippancy at the other). Also take a look through the Back Issues advert to see what sort of things we have already published — no point in re-inventing the wheel.

Once you've sent off your article or proposal, please don't hassle us for a decision. We receive far more submissions than we can ever use and it takes us a while to sort through them, acknowledge receipt and give an opinion one way or the other. Please be sure to tell us if you've sent the article to another magazine; it would be very awkward indeed if the same article appeared simultaneously in two publications! Frankly, we're more likely to accept something which has been offered exclusively to us.

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Micro Business Systems PLC, 119-120 High Street, Eton, Berkshire. Tel: 0932 42777.
Terrace Road, Walton-on-Thames, Surrey. Key Computer Centres, Enterprise House, 15/16 Pall Mall, London EC2M 4JS. Tel: 01-377 1200.
GSI Ltd., Stanhope Road, Camberley, Surrey. Tel: 01-751 5791.
Ferrari Software Ltd., 683 Armadale Road, Colchester, Essex CO1 2XB. Tel: 0206 865835.
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(Sperrings Computer Shops Ltd.)
Spencer House 12-14 Carlton Place, Southampton. Tel: 0703 39571.
Software Sciences, Abbey House, 282-292 Farnborough Road, Farnborough. Hants. Tel: 0252 544321.
South East Computers Ltd., 15 Castle Street, Hastings, Sussex. Tel: 0424 426844.
South East Computers Ltd., 31 Walting Street, Canterbury, Kent. Tel: 0227 59917.
South East Computers Ltd., 29 High Street, Maidstone, Kent. Tel: 0622 681263.

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Digital Equipment Co. Limited, P.O Box 110, South Coast House, Wimborne Road, Ferndown, Dorset. Tel: 0202 893040.
Wynnmark Computing, 20 Milford Street, Salisbury, Wilshire SP2 2AP. Tel: 0722 331269.

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Micro Business Systems PLC, Wirksworth, Derbyshire. Tel: 062-9823120.
MMS Ltd., Ketelwell House, 75-79 Tavistock Street, Bedford MK40 2RR. Tel: 0234 406001.
Zygal Dynamics PLC, Zygal House, Telford Road, Bicester, Oxon OX6 0XB. Tel: 08692 3361.

STC Micros, West Road, Harlow. Essex CM20 2BP. Tel: 0279 443421.
Sytec Products Ltd., Cord House, The Causeway, Staines, Middlesex. Tel: 0784 639911.

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Rank Xerox (UK) Ltd., The Xerox Store, South Gate House, Wood Street, Cardiff CF1 1EW. Tel: 0222 40118.
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Micro-Centre (Complete Microsystems) Ltd., 30 Dundas Street, Edinburgh EH3 6JN. Tel: 031-556 7354.
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Pilgrim Business Machines Ltd., Northfield Place, Aberdeen. Tel: 0224 645104.
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**PACKAGES**

PCW's 'Packages' section is produced bi-monthly, alternating with our 'In Store' hardware guide. We have confined coverage to business packages which are available and supported at national level and which have been in use for at least six months in a minimum of five sites. Producers of packages which fall within these constraints should send details or updates to: Dick Olney, PCW, 62 Oxford Street, London W1.

The layout has been designed to allow you to distinguish which packages are available for the application you have in mind and to show you which packages are available for your computer if you already have a machine. In either case the code enables you to locate the supplier's telephone number in the table below.

All details published are the latest made available — some may have changed since this issue went to press.

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### Applications

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**SUPERBRAIN II**

--- THE BEST THING SINCE SUPERBRAIN! ---

**OFFERS:**
- Basic Interpreter.
- Full Reverse Video and True Descenders.
- Superbly Improved Circuitry.

**ALL AT REDUCED COST!**

Choose From:

- **THE JUNIOR (J R)** WITH 350K FLOPPY DISKS
- **THE QUAD DENSITY (QD)** WITH 750K FLOPPY DISKS
- **THE SUPER DENSITY (SD)** WITH 1.5MB FLOPPY DISKS

FROM £1665 EXCL. VAT

**SUPERBRAIN CAN NOW BE CONNECTED TO HARD DISKS**
FROM £2565 FOR 10MB OF EXTERNAL HARD DISK STORAGE

+ **COMPUSTAR**

- LETS 255 USERS SHARE 10 OR 144MB OF WINCHESTER DISK

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and in Scotland: Micro Change Ltd. Telfer House, 74/80 Miller Street, Glasgow Tel: 041 204 1929

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word processing + accountancy + financial modelling + calculation
record keeping + sales office management + accounts + payroll + graphics
engineering + communications + languages + solicitors + CAD
K2Job
PACKAGES

Application

Machine

Price

Apple II
Apple II
Apple II
Apple II
Apple II
Apple II
Apple II
Apple II

£300
£300
£455
£225
£295
£250P
£600
£490
£199
£450
£350
£500

SS

£375
£400
£400
£400
£275
£390
£350
£300
£425
£500
£400

LI

Apple 11

CBM/8032
CBN/8032

CP/M
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Code

Application

P2

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T2
L4
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C11

W3
L3
G1

M3

15

CP/M
Cromemco
North Star

Horizon
North Star
Horizon

V2

£400
£400

M9

£250
£400

B5
B3

M3

Philips P2000
Superbrain
Superbrain
Superbrain
Superbrain
Tandy Model I

PCC 2000

North Star
Horion

£400

135

FCC 2000

Simpelec Trito9 3 £370
PET/CBM
£200

B2
C2

PET/CBMH3
PET,'CBM
Philips P2000

£199
£100
£450
£400
£400
£90
£90
£225

Sharp PC3201
Superbrain
Superbrain
Tandy Model 1

£350
£400
£357
£275

Vector
8080/Z80
8080/Z80
General purchase
transaction proc.

P4
P2
M3

-Invoicing

Investment portfolio

S4

C5

£495

S3

Greyhound race
program

Apple II

£750

M6

Health authority PPM

Sorcerer

£2500

L2

Housing association

PET/CBM

FOR

M7

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Challenger

CP/M
CP/M
CP/M
CP/M
CP/M
CP/M
CP/M
CP/M
CP/M
CP/M
CP/M

Act Sirius

£1200
£250
POR

SI

Cromemco

S2

£425
£450

P2

North Star
Horizon
North Star
Horizon
North Star
Horizon

Apple II
Apple II
Apple II
CBM/8032

£490
£150
£750
£250
£975
£750
£1250
£155
£400
£250

CP/M
CP/M
CP/M
CP/M
CP/M
CP/M
CP/M
Cromemco

North Star
Horizon
North Star
Horizon
North Star
.Horizon
Philips P2000
Superbrain
Superbrain
Tandy Model I
Tandy Model I
Industrial cleaning

Industrywork stud

£250
£975
£150
£750
£1200
£40
£40

CP/M

package

Industry Factory
loading

£750

POR

K2
P1
1.4

w)
135

/33

WI

85
P4

M3
SI

£360
£360
£300

Local government
housing maint

RAIR Black Box

POR

A3

Lotteries

PET/CBM

£45

H2

Magazine subscriber

CP/M
Altos (CP/M.
MP/M)
Apple II
Apple II
Apple II
Apple II
Apple II
Apple II
CP/M
CP/M
CP/M
CP/M

£950

S9

£75

B1

£300
£50-150
£300
£300
£40
£100
£450
£250

A2

M3

£75

S9

POR

G4

£195
£45
£15
£75
£35
£290
£140
£40
£75

WI

£75
£795

£550
£1000

S2

131

S3

15
C2

JI

North Star
Horizon

G2
P4

T3

PET/CBM
PET/CBM
PET/CBM
PET/CBM

SI
MI

Sorcerer
Superbrain

JI
01
A4

Tandy Model I
Tandy Model I

£50-150

Act Sirius 1

£95
£14
£40
£25
£99

M3
S6

Tandy Modell
Tandy Model II

MI

C5
C2

Mail shot

Apple II
Apple II
Apple II
Apple II
CBM/8032

C7

Challenger

01
S2

PI
P2
VI

T2
T5

£250

M3

Membership accting

Motor Dealer

NEDO price adjust-

£100
£350
£25-50

135

ment

B1

POR

31

£199
£150
£290
£250
£150
£90
£90
£25

15

Nominal ledger
Order entry/
invoicing

£75

£125
£265

£280
£350
£325

Al
P4

L2
M3
S6

MI
MI
HI
TI
11

01
A4
sa

H2

Al

BI
H3
L2
C9

MI
MI

£25/38/55 HI

£350

Al
S2
P2

T2
15
W3

05
T5

£90

M3

£450
£90
£75 +
£75
£75 +
£160

132

Apple II
CP/M
MCZ Zilog
PET/CBM

£75

P2
G4

Act Sirius I
CBM/8032

Simpler Triton 3

WI
B7

B3

GI

£99
£250

Tandy Model I
Tandy Model II
Tandy Model II
Tandy Model III

63

£100

C4

£50:150

Superbrain

S7
B5

B5

S4

M3
S7

I I

PCC 2000

LI
M3

T5
G4
W4
M9

P2

C7
C4

North Star
Horizon

C7

K2

£25
£450
£90
I:100

CP/M
CP/M
CP/M
CP/M
CP/M
MCZ Zilog

Al

S2
S5

LI

G4

MI
G4

A4

£250

II

£85

H2

£345

CP/M

£950+
POR

C7
P3
G4

Farnos

£5000

M2

Apple II

£200

S8

CP/M-86
Apple II
CBM/8023
CP/M
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£350
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£650

C7

Pad to plotter systems

01
PI

Apple II
Apple II

£250
£180

P2
C8

Payroll

Act Sirius I

£300+

01

Act Sirius 1

£195

AI

POR

A2

£200

S2
S5

POR
£199
£1500

B7

Apple II
Apple II
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Apple II
Apple II
CBM/8032
CHM/8032

XI

X1
XI
X1

X1

Act Sirius 1

£185

Instrument logging

Sorcerer

£500

L2

Insurance broker

Act Sirius I

£450

CP/M

POR

Apple II
Apple II
Apple II
Apple II
Apple II

M3
M3

Apple II

Inn Management

C7
G4

£1200

S3

£795

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£300
£450
£300
£855
£600
£1470

£150
£150

Office admin

C7

MP/M)

Superbrain

64

CP/M
PET/CBM

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POR

T5
M3
15
G4

S7

XI

Ad Sirius I
Altos (CP/M,

VI

£1000
POR

£990
£750

CBM/8032

£80
£99
£150
£99

CP/M
CP/M

£990

Integrated accts

Apple II
Apple II
CP/M
CP/M
CP/M
North Star
Horizon

Jewellers System

Apple II

Insurance renewals

C4

Letter writer

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Apple II
CP/M
PET/CBM

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POR

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Tandy Mode II
Tandy Mode I
Tandy Mode
Tandy Mode 11
Tandy Mode II
Tandy Mode III
UCSD-p
8080/Z80

M3

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£199

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£400

Sorcerer
Superbrain
Superbrain

135

B5

POR

Philips P2000

M5
CIO
G4

P2

£690

£325
£250
£250
£100
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£300

PET/CBM
PET/CBM
PET/CBM
PET/CBM

M3

M2
B3

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M4
M4
A3

Apple 11

B5

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Apple II

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S2

Apple II
CP/M
RAIR Black Box
I

M9

£20

Hotel management

Incomplete records

T5

Tandy Model I

P4

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G3 -

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CP/M

B5
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B3

LI

Philips P2000

G3

Legal precedents

M3

£995

A

Code

£275

GI

POR

Act Sirius
Act Sirius
Act Sirius

Price

8080/Z80

order control

C4

£950

Hotel billing

POR

LI

8080/Z80
8080/Z80

Apple I
Apple I
Apple I
Apple I

package

CI I

8000 Series

Apple 1

LI
63

CBM/8032

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Vector

S6

MI
MI
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£225/325 TI
£425
TI

Tandy Model II
Tandy Model 1
Tandy Model 1
Tandy Model 11
UCSD-P

Tandy Model II
Tandy Model I
Tandy Model II
Tandy Model III

15

T5
P3

Machine

Application

Mailing List

PET/CBM
PET/CBM
PET/CBM
North Star
Horizon
PET/CBM
PET/CBM
PET/CBM

£950/
1250

W2

MZ-80K
North Star
Horizon
North Star
Horizon
North Star
Horizon

14
M5

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Code

£300
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Price

Apple II
Apple II
CBM/8032
CBM/8032
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CP/M
North Star
Horizon

PET/CBM
PET/CBM
Philips P2000
Superbrain

Tandy Model I
Tandy Model II
Tandy Model II
UCSD-p

£1500

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POR

MI
MI

£265
£350

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Challenger

CP/M
CP/M
CP/M
CP/M
CP/M
CP/M
CP/M

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POR
£200
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£375
£250P
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£490
£199
£375
£350
£24
£450
£475
£450
£500
£390
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£450

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VI
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S4
T2CP/M

L4
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P3

W3
C7
L3

LI

C4

GI
M3
B5
B3

PCW 205


### Packages

<table>
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<th>Machine</th>
<th>Price</th>
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<td>£425</td>
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<td>W1</td>
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<td>L5</td>
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</tr>
<tr>
<td>CP/M</td>
<td>£199</td>
<td>T5</td>
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<tr>
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<td>G4</td>
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<tr>
<td>CP/M</td>
<td>£800</td>
<td>M9</td>
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<td>£500</td>
<td>G2</td>
<td></td>
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<tr>
<td>North Star</td>
<td>£150</td>
<td>B3</td>
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<tr>
<td>North Star</td>
<td>£350</td>
<td>B5</td>
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### Perpetual Inventory
- CP/M: £150 B5
- Commodore: £150 B5

### Personnel Records
- Apple II: £50 P2
- MCC Zilog: £400 H1
- PET/CBM: £81 H2

### Pest Control Generator
- PET/CBM: £50 S3

### Pacemaker Programs
- PET/CBM: £150 G2

### Pipeline Pressure Drops
- Apple II: £10 S10

### Pipeline Rating
- Apple II: £15 S10

### Point of Sale
- CP/M: £400 M9

### Postal Advertising Response Package
- Apple II: £50 S2

### Price List
- PET/CBM: £50 H3

### Product Management
- Act Sirius I: £254 C7

### Production Analysis
- Apple II: £93 P3

### Production Control
- CBM/8032: £500 M1
- PET/CBM: £85 P3

### Profit Groups
- B00/Z00: £175 G3

### Profit Warning
- B00/Z00: £220 G3

### Profit Continuation
- B00/Z00: £130 G3

### Recording and Storage
- Apple II: £40 P2

### Property Management
- Act Sirius I: £160 + C14
- Apple II, III: £650 C13
- Apple II, III: £285 M1
- CMB/8032: £900 + C14
- CP/M: £750 - £1500 C4
- CP/M: £400 M3
- CP/M: £1400 B7
- CP/80: £1600 + C14
- North Star Horizon: £400 M3
- Superbrain: £400 M3
- UCSD/S: £150 S4

### Publishers System
- CP/M: £150 S1

### Purchase Ledger
- Act Sirius I: £85 A1
- Apple II: £300 A2
- Apple II: £300 A2
- Apple II: £290 A2
- Apple II: £300 A2
- Apple II: £315 V1
- Apple II: £225 P4
- Apple II: £60 B4
- Apple II: £200 G4
- Challenge: £25 G7
- CP/M: £650 G1
- CP/M: £425 L9
- CP/M: £400 M3
- CP/M: £165 ST
- CP/M: £275 R3
- CP/M: £300 W1
- CP/M: £425 B6
- CP/M: £500 T4
- CP/M: £400 M3
- CP/M: £199 T5
- CP/M: £350 C7
- CP/M: £200 P4
- CP/M: £450 C3

### Stock Control
- Act Sirius I: £135 £3
- Apple II: £275 £3
- Apple II: £800 £3
- Apple II: £150 £3
- Apple II: £400 £3
- Apple II: £200 £3
- Apple II: £150 £3
- Apple II: £325 £3
- Apple II: £250 £3
- Apple II: £250 £3
- Apple II: £350 £3
- Sharp PC 3021: £300 P2

### Surveying
- Act Sirius I: £135 £3
- Apple II: £275 £3
- Apple II: £800 £3
- Apple II: £150 £3
- Apple II: £400 £3
- Apple II: £200 £3
- Apple II: £150 £3
- Apple II: £325 £3
- Apple II: £250 £3
- Apple II: £250 £3
- Apple II: £350 £3
- Sharp PC 3021: £300 P2

### Textile Library
- Act Sirius I: £135 £3
- Apple II: £275 £3
- Apple II: £800 £3
- Apple II: £150 £3
- Apple II: £400 £3
- Apple II: £200 £3
- Apple II: £150 £3
- Apple II: £325 £3
- Apple II: £250 £3
- Apple II: £250 £3
- Apple II: £350 £3
- Sharp PC 3021: £300 P2

### Time/Cost Recording
- Act Sirius I: £135 £3
- Apple II: £275 £3
- Apple II: £800 £3
- Apple II: £150 £3
- Apple II: £400 £3
- Apple II: £200 £3
- Apple II: £150 £3
- Apple II: £325 £3
- Apple II: £250 £3
- Apple II: £250 £3
- Apple II: £350 £3
- Sharp PC 3021: £300 P2

### Storage Tank Costing/Volumes
- Act Sirius I: £135 £3
- Apple II: £275 £3
- Apple II: £800 £3
- Apple II: £150 £3
- Apple II: £400 £3
- Apple II: £200 £3
- Apple II: £150 £3
- Apple II: £325 £3
- Apple II: £250 £3
- Apple II: £250 £3
- Apple II: £350 £3
- Sharp PC 3021: £300 P2
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Business Address

Tel. No. PCW2

PCW 207
Beware that you do not lose the substance by grasping at the shadow

Even Aesop would have been confronted by confusion. Coming from the Fifth Century BC, the average newsagent would seem like one enormous fable factory. Row after row of micro-computer magazines, all filled with conflicting opinions. Each, in its own way, claiming to be the fount of all knowledge.

He would soon deduce, as many have already discovered, that reading the wrong magazine is no better than chasing shadows. The truth, he would conclude, is often hidden, as indeed are the shadows in the darkness.

Of course, he would have to admit that some micro-computing magazines are, in their own way, very good indeed. But many, he would soon realise, are but pale and imprecise imitations of the genuine article.

Careful reading would convince him that for complete, comprehensive and authoritative coverage, there really is no substitute for PCW.

Nor would he be alone in his opinion. Not for nothing is PCW Britain’s largest selling micro-computing magazine.

He would appreciate PCW’s continuous commitment to editorial excellence. The unrivalled attention to detail and accuracy.

Eureka!, he would exclaim, PCW is indispensible. Compulsive and essential reading, every month.

Being no fool, Aesop would place a regular order with his newsagent. But, with no newsagent close to hand in Ancient Greece, Aesop would go one better. He would subscribe.

After all, you do not have to look long to realise that a magazine of the quality of PCW often sells out extremely quickly. Far better to be sure of getting your copy, rapidly delivered to your door by your postman, immediately upon publication.

And so, being an exceptionally wise man, Aesop would subscribe today. He would know that having found the substance, he could afford to wait no longer.

Be like Aesop. Return the subscription order card opposite immediately. Before the opportunity is lost in the darkness.

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BUILD A BETTER BRITAIN WITH C-D-S (UK) MICRO

IMPORTANT ANNOUNCEMENT
TO ALL U.K. MICRO COMPUTER PEOPLE

A national scheme for local community developments and business initiatives is being set up, which will be of great interest to everyone involved with home/micro computers and ancillary equipment, whether they are students, enthusiasts, users, designers, distributors or manufacturers.

The scheme is called C-D-S (UK) MICRO and it offers considerable opportunity for large scale supply of hardware, the design and production of special programs software, and unique commercial activity. Micro computer users can set up dynamic C-D-S management projects in their own immediate local area as profit-making business enterprises.

For general information about the scheme, together with schedules, plans, programs and specifications please send £5.00 (users) or £20 (suppliers & distributors) to: C-D-S (UK) Micro, 89 Hexthorpe Road, Hexthorpe, Doncaster DN4 0BE.

MAKE YOUR MICRO EARN ITS KEEP – AND YOU A GOOD BONUS INCOME

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Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.
ACC NEWS
Rupert Steele presents his monthly round-up of news from the Amateur Computer Club.

Communications looks set to become the front end of computer development work in the future. It is possible that, within the next 15 years, most useful single machine software will have been written, and people will have to turn their attention to communications. Prestel has been the first attempt to bring data communications to the nation as a whole, and (in the language of the Civil Service) it has not been an unqualified success. Its major achievement so far has been to pinpoint many of the problems of such an undertaking.

Prestel has in the past suffered from being too small and too expensive; and possibly being launched too soon. The small size of the database has meant that an information provider would only gain marginally from being online. If having Prestel and being an IP were very cheap, then the marginal benefits would have been enough to see the system take off. But because an IP account is expensive, and there is a connection charge in addition to the phone bill (and, until recently, adaptors were hideously expensive), the system has never taken off and most of the computers are in motababs.

It is only now, through involving the home micro owner, with cheap adaptors and tangible benefits such as micro software ('telephone in Miceront (800) and home banking ('homelink'), that the numbers of subscribers may build up. Morals: if you're setting up a completely novel system, you must expect to lose a lot of money, if you want it to take off. Setting unattainable economic targets will strangle it at birth.

Technology is now entering a new phase in communications. We are setting new methods for handling large bandwidths, through innovations such as fibre optics and large scale exploitation of existing ideas (which reduces prices) such as cable TV. I'd like to start some kind of discussion, through this page, of the ideas the amateur movement have about all this. Should there be a programme to install BT-operated fibre optic or co-ax links to the nation's houses, and, if so, what would be done at these frequencies? Should channels be made available for high bandwidth modern communications, and would we like to see a high speed high res 'Prestel' like service? Can the cable TV system (if it ever gets 'off the ground') be used with micros? Now is the ideal time for everybody out there to give their high bandwidth wish list an airing and, you never know, a man from the ministry might actually read PCW and take note.

News
I hope you're receiving Club Spot 800*, on Prestel page *80084, loud and clear. By the time this comes out, Club Spot will have been in operation for three months or so. You aren't editing on Club Spot yet? Then, contact me. We are thinking of holding a further Editors' Conference in the autumn, so the more people who write asking about editing in club spot, the more likely the conference is to come off.

A couple of exhibitions are on in June. On Sunday 12 June, there is the South of England Personal Computer Fair to be held at the Wood Green School, Witney, Oxfordshire OX8 6DX. The ACC and OPe-CC will be there, showing the amateur flag. Enquiries about the show to Mr P J Wilde on 0993 2355 during school hours.

This year's IPC Computer Fair is at Earl's Court from 16-19 June. The ACC will be there, as will lots of other clubs. If you didn't get a stand for your Club via David Annal, then too bad. But you might like to contact him for a stand for the PCW show this autumn. His address is: 142 Windermere Road, London SW16 5HE. The ACC wouldn't mind a bit of help on the stands. If you're interested, contact Peter Whittle, 49 Bartlemas Road, Oxford OX4 1XU or give me a call. The ACC has lots of nice A3 posters to give away for you to display in your Club meeting place, shop or library. Let me know if you want one (or more); they are free, gratis and for nothing. Peter Whittle (address above) has some ACC T-shirts for sale: write for details or pick up one at a show.

Club things
At the beginning of this year, a new club was formed in Gravesend. The Secretary is Steve Janday and the Club's address is: Gravesend Computer Club, c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Their membership is about 50, with a wide range of machines owned.

North a bit, we come to Mr Osborne of 8 Elvington Kings Lynn, Norfolk, who might like to start a Spectrum User Group in his area. So why not drop him a line if you are of like mind?

Continuing our northward trek on the east coast, Mr Ian Waugh of 13 Briandine Drive, Wardley, Tyne Wear NE41 8AN writes of his group of BBC computer owners, who are thinking of becoming a formal club. So if you're in Wardley and have a BBC m/c, then you know who to contact.

Still north and east, we have the Grimsby Computer Club (contact Kevin Turner on Grimsby 824063 - evenings). With a membership of over 85, they meet at St James Choir School in Grimsby. They have lots of ideas, such as cheap equipment hire (including Teach-yourself BASIC tapes) and a business appreciation course. Interested? Then give Kevin a call.

Down in the deep south, a Mr P Cherriman writes of the Arun Microcomputer Club, which meets at the Wick Amature Computer Club, c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Their membership is about 50, with a wide range of machines owned. And finally, I cannot resist a mention for the Mold Computer Club, who recently wrote saying 'the Mold Club is a non-constitutional organisation...we have more applicants for membership than we can manage [and] we would request you to remove our name from your correspondence file, and not advertise us in any way. So if you live in Mold, you can't join your local club. How Moldy.

* For further information about the ACC, or anything mentioned in this article, contact: Rupert Steele, St John's College, Oxford OX1 3JP or telephone (0865) 512811.
CTUK! CONTACTS

Ray Skinner
62 Central Avenue
Billingham
Cleveland TS23 1LN

Philip Joy
130 Rush Green Road
Romford
Essex

Peter Herring
Ordnance Road Library
Ordnance Road
Enfield Middx

Derrick Daines
18 Cuttings Avenue
Sutton In Ashfield
Notts

Patrick Colley
52 Queenway
Reading
Berks RG4 6SJ

J M A Kilburn (Headmaster)
Shaftewold Norden
Conventry Middle School
Shaftewold Lane
Norden
Rochdale OL12 7QR

Robin Birdalber
Polytechnic of North London
Holloway Road
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2 Victoria Terrace
Dorchester
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Pam Pollicott
South Rushlip Library
Victoria Road
South Rushlip
Middx

Rex Shipton
17 Woodlands Avenue
Easacto
Middx

Susan Kelly
Head of Reference Services
PO Box 4
Civic Centre
Harrow
Middx

Andrew Heyler
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25 Beachdale
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Enfield
Middx

Keith Taylor
Carter Hydraulic Works
Thornbury
Bradford BD3 8HG

Alan Hooley
21 Brammay Drive
Tottington
Bury BL8 3HS

Vernon Quainance
30 Beatrice Avenue
Norbury
London SW16 4UN

BJ Candy
9 Oakwood Drive
Glasgow GL3 3JF

Roger Shears
18 Woodmill Lane
Bitterne Park
Southampton SO2 4PY

Chris Woodford
31 Hopley Road
Anslow Burton-On-Trent
Staffordshire

Mike Philp, Steve Collins or Dave Lee
The Library
Ealing Road
Wembley
Middlesex HA0 4BR

John Byfield
Moonmakers
The Rutts
Bushey Heath
Herts WD2 1LH

Raymond Southall
(Barbican) Business Telecom Exh. Contact: Online Ltd, 09274 28211.

Michael Stott
(Barbican) Int Conf & Exhns on Comps & Comms in the City. Contact as above

Nicholas Kock
(Barbican) Computing and Maths Dept. Contact: Computing and Maths Dept.

Richard Dean
(Cornwall) Apple Users Group. Contact: John Heffernan or Anthony Aylott

Stephen Price
(Bedfordshire) Apple Users Group. Contact: Harry Price

Mark Taylor
(Bedfordshire) TRS-80 Users Group. Contact: Mark Taylor

Sutton in Ashfield
Community Middle School
18 Cuttings Avenue
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Peter Jarvis
c/o Health Dept
Corporation of London
Guildhall
London EC2

Vernon Gifford
111 Selhurst Road
Croydon
London SE25 6LH

Peter Stone or
Alan Strangman
Computing and Maths Dept.
The Polytechnic
Wulfruna Street
Wolverhampton WV1 1LY

J G Batch
Central Library
Clapham Road
Lowestoft NR32 1DR

Tony Cartnell
54 Foregate Street
Worcester WR1 1DX

Lyn Antill
1 Defoe House
Barbican
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Peter Jarvis
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Guildhall
London EC2

Network News

These are all the European networks of which we're aware. Most are free — but phone them for details.

Forum-80 Hull ... (Forum-80 HQ) Tel: 0482 895169, System operator: Frederick Brown. International electronic mail, library for up/down loading software.

Forum-80 Users Group, Pet Users section shopping list system hours, 7 days a week midnight to 8.00am, Tues/Thurs 7.00pm to 10.00pm, Sat/Sun 1.00pm to 10.00pm.

Forum-80 London ... Tel: 01-747 3191. System operator: Leon Jay. Electric Mail, library for downloading. System hours: Tues/Fri/Sun 7.00pm to 11.00pm.

Forum-80 Holland ... Operator: Nico Karssemeyer, Tel: 01 313 512 33. Facilities: electronic mail, program up/downloading, shopping list. Hours: Tues-Sat 1800-0700 nightly, from 1800 Sat-0700 Tues.

CRBS London ... Operator: Peter Goldman, Tel: 01-399 2136. Facilities: electronic mail, program downloading. Hours: Wed 1900-0900 & 1900-2200, Fri 1900-2200, Sun 1600-2200.

Forum-80 Milton ... (TRS-80 Users Group 80Net) Tel: 090 66660. System operators: Leon Heller and Brian Pain. Electronic mail, library, newsletter, TRS-80 information system hours: 7 days a week 7.00pm to 10.00pm.

Forum-80 Liverpool ... 051-220 9733. System operator: Peter Toothill. Electronic mail, downloading, TRS-80 information. ACC ... members bulletin board, Peter Whittle (0908 44262).

Forum-80 Stockholm (Sweden). Tel: 010-468 190522.

University Research Computer ... Sweden. Tel: 010-468 23600, guests use password "66,66" for access.

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

London (Barbican) Business Telecom Exh. Contact: Online Ltd, 09274 28211

London (Barbican) Int Conf & Exhns on Comps & Comms in the City. Contact as above

London (Wembley Conf Centre) Int W/processing Exhns & Conf. Contact: 01-405 6233

Melbourne (CETIA) Comps, Comms & Electronic Tech Exhns. Contact: CETIA, PO Box 259, Roseville, Sydney 2069.

Slough (Fulbourn Centre) Nat Apple Exhns & Convention. Contact: Val Seddon, 0614 560189 (night)

London (Cumnard Int Hotel) Int Commodore Comp Show. Contact: Crouchmead Comms Ltd, 01-778 1102

Brazil (Data Processing & Equip for Offices. Contact: D Empreendimentos, SA Rua Francisco, Rocha 551, 24-26 May

London (Holiday Inn) Computer Day Exhns. Contact: Crouchmead Comms Ltd, 01-778 1102

London (Earls Court) Computer Fair. Contact: Reed Exhns, 01-643 8040

Manchester (Belle Vue) Compe North. Contact: IPC Exhns Ltd, 01-643 8040.
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FILE MANAGER £20.00
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DATABASE £22.57
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Full FIG Forth
FORTH £185.00
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Keep track of your home finances
program
Multipurpose data management program
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HISOFT PASCAL 4 (Disc) £40.00
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BROADCAST PROGRAMS
Unstoppable as I seem to be on a 'meteoric rise to obscurity' (to quote one comment of
wry congratulation from a referee), the time has come to hand over to a new programs
editor - Surya.
Surya has stepped in, perhaps a little at the deep end, from a background in
freelance writing, educational software programming and work with children. From
now on he will be the person to contact about anything concerning programs.
I'm sure all of PCW's readers will join me in extending Surya a warm welcome, and
in wishing him all the best with us on PCW.

It only remains for me, in the capacity of erstwhile programs editor, to say
'thankyou' to all the referees, authors and readers who've put fingers to keyboards and
cassette recorders over the past 18 months.
Programs will continue in the same vein for the foreseeable future. But naturally
Surya's great organisational talents will ensure a faster turnover of software and
related correspondence. As a part of my own 'obituary', I have only to apologise for
all the letters that went unanswered - correspondence to PCW does tend to be one-way
—and to express the hope that Surya will not be short of programs to include in PCW.
Maggie Burton

Ok. Boring stuff first. When submitting programs to PCW, please include the following:-
(a) A cassette or disk of the program.
(b) A listing on plain, white paper (typewritten if no printer available).
(c) Documentation - this should be comprehensive, but please try to be brief.
(d) A suitable sae if you would like your material to be returned after use.

Generally speaking, programs which are rejected for any reason are returned fairly
quickly so 'no news...'

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Maggie Burton

BBC Balloon
by A Roe

Ok, so it's another maze game. With this
game, however, the object you have to
manoeuvre through the maze is not a pac-
man or gobble monster, but a hot-air
balloon (what else?). Your balloon will be
punctured if it strikes a wall of the maze, so
a fairly amount of skill is required. The erratic
motion of the balloon (to simulate the effect
of the wind) adds to the difficulty.
You are given three balloons, with a
bonus balloon being awarded for every
10,000 points scored. There is no time
limit.

One criticism is that the program only
offers a single maze, so it is possible to learn
the route thus detracting from the challenge
of the game. Overall, though, the game is
well-written and makes impressive use of
the BBC's excellent graphics.

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** Programs of the month **

** Apple VAT**

by Alex Lake

This is an excellent VAT records program written for the 48k Apple II with at least one disk drive. The program allows you to enter your purchases and sales in the form in which they would normally be kept. VAT records on disk and prints your VAT summaries for each of your quarterly tax periods.

All items are automatically sorted by date, and may be deleted and re-entered in case of error. The program does not automatically update its files, so it is important to remember to use the UPDATE program.
The value of Y$ in line 510, and this can be updated later by resetting in line 260. The default tax year is 1983, the first month of your financial year is set has been entered.

DISK FILES option whenever new data are entered.

The error-trapping routines are comprehensive, and the program as a whole is very professionally presented and easy to use.

The printer used for the listing given below doesn't distinguish particularly well between 0(string) and 0(numeric): the variable in lines 410 and 1480 is OOS (letter O, number 0). The variables CO, COS, CO( ), COS( ), MOS, NO, NO( ) and POS are all letters.
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- **BIG EARS** +16 LINE CONTROL PORT.

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- **570 T36 = “CLIENT INVOICE V.A.T. INVOICE DATE**
- **+VAT** + TOTAL DD MM**
- **650 T49 = “DATE CLIENT NET FEE V.A.T. INVOICE**
- **“” +VAT” “TOTAL”**
- **590 T54 = LEFT$ (“DATE CLIENT” + SP$)31**
- **600 R16 = “ENTER HELP FOR HELP OR “MENU” FOR MENU**
- **610 R25 = “TYPE: FOR LAST MONTH > FOR NEXT MONTH ESC FOR MENU”**
- **900 PRINT “PRINT IS THIS THE FIRST SESSION “ Y = “”? “GET R$**
- **910 IF R$ = “Y” THEN GOSUB 9000: GOTO 1000**
- **920 PRINT : PRINT “YOU WANT THE DISK RECORDS ? YES”**
- **HTAB 32: GET R$: IF R$ < “N” THEN GOSUB 9000**
- **1000 REM END**
- **930 GOSUB 1160: HOME**
- **1070 END**
- **1090 PRINT “CHOOSE ONE OF THE ABOVE OPTIONS”,**
- **1100 END**
- **1150 PRINT “PRINT : PRINT NEXT M”**
- **1200 PRINT “CHOOSE ONE OF THE ABOVE OPTIONS”**
- **1250 END**
- **1300 PRINT “CHOOSE ONE OF THE ABOVE OPTIONS”**
- **1330 END**
- **1350 PRINT “CHOOSE ONE OF THE ABOVE OPTIONS”**
- **1390 END**
- **1400 PRINT “CHOOSE ONE OF THE ABOVE OPTIONS”**
- **1420 END**
- **1450 END**
- **1480 END**
- **1500 END**
- **1550 END**
- **1580 END**

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**PROGRAMS**

- 72+0 REM ----MONTHLY TOTALS----
- 7250 DIG = 8
- 7260 FOR J = 1 TO 4
- 7270 AS = MN$(M - 4 * (J > 1)) + TT$(J) + SS$
- 7280 FOR I = 1 TO 3
- 7290 B = E$(M - 3 * 3 + 1 + (J > 3)): GOSUB 1100
- 7300 AS = AS + SS + S$
- 7310 NEXT I
- 7320 RETURN ---QUARTERLY TOTALS----
- 7330 FOR J = 1 TO 4
- 7340 AS = MSS$(M) + M$(TT$(J),30 + 11 * (J = 1) + (J = 0,11)) + TT$(J)
- 7350 IF J = 1 THEN 7370: ST(J) = ST(J) + ST$(J): NEXT J
- 7360 NEXT MC
- 7370 REM ---TOTALS-----
- 7380 AS = M$(TT$(J),30 + 11 * (J = 1) + (J = 0,11)) + TT$(J)
- 7390 FOR J = 1 TO 3: ST$(J) = ST$(J) + VAL(M$(TT$(J),I)) + 8 + 25,71
- 7400 NEXT J
- 7410 NEXT IT
- 7420 PRINT: GOSUB 1460: NEXT J
- 7430 PRINT: PRINT "NOW PREPARE FOR THE OUTPUTS.": GOSUB 1270: PRINT "PRE
SS A KEY TO COMMENCE PRINTING....": GET AS
- 7440 PRINT
- 7450 PRINT AS;"PRE$": NEXT J
- 7460 PRINT AS;"PRE$": NEXT J
- 7470 PRINT AS;"PRE$": NEXT J
- 7480 PRINT AS;"PRE$": NEXT J
- 7490 PRINT AS;"PRE$": NEXT J
- 7500 PRINT AS;"PRE$": NEXT J
- 7510 IF K(0) = 0 THEN 7500
- 7520 FOR I = 1 TO NO$(M)
- 7530 AS = 8	$
- 7540 IF IT = 1 THEN AS = MN$(M)
- 7550 FOR IT = 1 TO 3: ST$(J) = ST$(J) + VAL(M$(TT$(J),I)) + 8 + 25,71
- 7560 NEXT MC
- 7570 Q = ST(J * 3 - 3 + I + (J > 3)): GOSUB 1180:A$ = A$ + 8$ + ST$(J)
- 7580 FOR MC = 0 TO 2: M = FN M(MC + SM)
- 7590 PRINT LI$: PRINT
- 7600 FOR I = 1 TO NO$(M)
- 7610 PRINT AS;"TOTALS": GOSUB 1390
- 7620 PRINT AS;"TOTALS": GOSUB 1390
- 7630 PRINT AS;"TOTALS": GOSUB 1390
- 7640 PRINT AS;"TOTALS": GOSUB 1390
- 7650 PRINT AS;"TOTALS": GOSUB 1390
- 7660 FOR J = 1 TO 3: ST$(J) = ST$(J) + VAL(M$(TT$(J),I)) + 8 + 25,71
- 7670 PRINT LI$: PRINT
- 7680 PRINT AS;"TOTALS": GOSUB 1390
- 7690 PRINT AS;"TOTALS": GOSUB 1390
- 7700 PRINT AS;"TOTALS": GOSUB 1390
- 7710 PRINT AS;"TOTALS": GOSUB 1390
- 7720 PRINT AS;"TOTALS": GOSUB 1390
- 7730 PRINT AS;"TOTALS": GOSUB 1390
- 7740 PRINT AS;"TOTALS": GOSUB 1390
- 7750 PRINT LI$: PRINT
- 7760 PRINT: PRINT D$;"PRE$": RETURN
- 7770 PRINT: PRINT D$;"PRE$": NEXT J
- 7780 PRINT: PRINT D$;"PRE$": NEXT J
- 7790 PRINT: PRINT D$;"PRE$": NEXT J
- 7800 PRINT: PRINT D$;"PRE$": NEXT J
- 7810 PRINT: PRINT D$;"PRE$": RETURN
- 8000 REM READ IN FILES
- 8010 VBAR 10: HTAB 5: PRINT "READING:";
- 8020 VBAR 12: HTAB 5: PRINT "INPUTS":VBAR 14: HTAB 5: PRINT "OUTPUTS":0
- 8030 FOR M = 1 TO 12
- 8040 REM INPUTS
- 8050 FS = MN$(M) + "" + Y$ + "INF"
- 8060 VBAR 10: HTAB 19: PRINT FS
- 8070 PRINT D$;"OPEN": PRINT D$:"READ";FS
- 8080 INPUT FS
- 8090 VBAR 10: HTAB 12: HTAB 5: PRINT "INPUTS":VBAR 14: HTAB 5: PRINT "OUTPUTS":0
- 8100 FOR M = 1 TO 12
- 8110 REM OUTPUTS
- 8120 FS = MN$(M) + "" + Y$ + "OUT"
- 8130 VBAR 10: HTAB 12: PRINT FS
- 8140 PRINT D$;"OPEN": PRINT D$:"READ";FS
- 8150 RETURN

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It's a highly addictive game requiring fast reactions and the ability to keep an eye on several different parts of the screen at the same time. There's a sub-routine at line 930 which prints a message congratulating you on having survived for longer than five minutes; the only place I've seen this message is in the listing.

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Oric 1 Titles
by Keith Ollet

(A Sloppy Software Production)

Oric take the strain. . (Not sure that Adult
Bondage & games make them suitable for a
computer magazine, but there's
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for the dreaded STOMPER which will jump
out and kill you at the first opportunity!
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PET Zombies
by P Barker

'Zombies' is a PET version of the arcade game. A number of zombies converge steadily towards you, their one goal in life (?) to zombify you. Your only defence is to lure the zombies into the open graves dotted around the screen and thus postpone your eventual zombification for as long as possible. You can have anything between 20 and 50 zombies, and you control your movements via the number keys as explained in the program. If you avoid your horrid fate for longer than five minutes, I reckon that's pretty good going.

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A Sprite, for the unenlightened, is a programmable graphics object 24 pixels by 21 pixels — a sort of high resolution user-definable character. Working out the codes for these little creatures (or planes/mice/ space invaders/etc) is normally a boring and time-consuming task. This editor, however, allows you to "draw" your sprites on the screen using a joystick, so you can design hundreds of weird and wonderful creations quickly and painlessly. You simply draw your design, enlarge it along either axis as you wish and then let the editor produce the appropriate code which it will helpfully place into DATA statements for you.

To quote Simon Rockman, who checked the program for PCW, '...very nice to use, does the job perfectly and is better than the one I bought. I will be using this version in future.'

The joystick, by the way, must be connected to port 2.

COMMODORE 64 SPRITE EDITOR
by A R Bennet

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Spectrum Blaster
by Alan Green

Well, yes, it is another space-invader type game, but it has redeeming features. Like the fact that it demonstrates many of the special features of the Spectrum, including colour (BRIGHT, FLASH, INVERSE, etc), sound (ok, bleep) and user-defined graphics. And anyway, I happen to like zapping bug-eyed monsters!

The program runs on both 16 and 48k machines and contains full instructions: the usual 'blast the aliens before they kill your grandmother and eat your pet dog' (or visa versa, of course). Please note that the 'A', 'B' & 'C' in lines 40, 50 & 60 respectively should be entered as graphics A, B & C. The same applies to 'VERSE, etc), sound (ok, bleep) and respectively should be entered as graphics A, B & C in lines 40, 50 & 60.

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ACCOUNTANCY AID

The alternative, then, is to separate each day's processing and to enter the routine, introduce the entries for the day's bankings and then exit the routine. A disadvantage here is that you will probably get a form feed and have a separate sheet for each single day's banking transactions, and that adds up to a lot of paper at the end of the month.

Sadly, most of the suites that I have seen do not allow a sub-total of each day's transactions.

General
One of my personal hates is piles of stationery, and systems which insist upon keeping you hanging around while the printer trundles out the items that you have just entered. In my opinion, this defeats the whole object of efficient use of the machine itself. There are better ways of handling the situation such as entering the transactions in a transactional transactions file which is directed to the printer only when the contents of that file are posted into the ledger system. Some packages actually do this. Indeed, if the system is fast enough and you have an external large capacity printer buffer, you might well find your computer is held up by a transmission of data to your printer for seconds in the hour rather than a large number of minutes.

In reviewing accounting software over the last few years, I have compiled a series of notes which eventually found their way into a questionnaire and this questionnaire gets updated from time to time. Within the last four months I have sent it to a number of software vendors.

Pegasus answered it in full. TABS and Compact didn't reply. ACC banned me from demonstrations of Pulsar by its dealers on the grounds that I was dealing in a rival machine (it could be true).

Microshade – which was only available on CPM-80 machines when I tested it – did, as I mentioned above, include a cash book and also had a delightful standing order handling routine although the suite had other drawbacks. The company did respond to my various criticisms and it appears that the update of its suite (then being tested) incorporated some substantial improvements, and I look forward to seeing the new version.

For the last eighteen months I have actually been using an American version of the Peachtree software, which was written some three years ago. It has proved very reliable. Indeed, we haven't had one single error, but in many respects – probably because of its age and origins – it is very primitive. I feel sure that the Peachtree software available today will be much more sophisticated, although I have not actually tested it. Two years ago I saw Graffcom software and at the time I rejected it on the grounds that certain reports could only be received if they were printed rather than be seen on the screen, and I regarded this as time consuming and wasteful. Naturally, two years is quite a long time and things may have changed.
all at different memory locations and are designed to slot in with whatever other parts of the system are being utilised. The other parts include Sofmon — a comprehensive and easy to use disassembler/monitor — a graphics kit and a programmer's toolkit.

Softime is unique in that it offers a digital clock with alarm and stopwatch facilities that can be left on display while entering or running a program. It is fairly accurate in normal operation but is adversely affected by SAVE, LOAD or BEEP. But the real value of Softime is the fact that it gives nine function keys — seven of which may be defined by the user with up to 100 bytes of Basic. These keys are accessed by using the SPACE key as a third shift key — holding down SPACE and key 0 allows you to define/edit/inspect each of the digit keys. Key 1 is set to RANDOMIZE USR 49152 for each key must be 100 bytes or less. You can, of course, change the functions on keys 1 and 6 if you wish. You have the choice of defining a key with code that is executed immediately (as in RAND USR 49152) or with Basic that is brought down in editing mode. This is done by putting REM after the definition — thus to access the toolkit you would define, say, key 3 as RAND USR 63488: REM. If you now press SPACE and 3 the line is brought down and you simply tack the toolkit function on the end before pressing ENTER to execute it.

I was not over-impressed with Softek's compiler, which seemed to me to be over-priced in comparison with its rivals. With Softime, though, I think the Softek programmers have excelled themselves — as far as I know it is the first implementation of function keys on the Spectrum and it certainly makes using the compiler, toolkit or assembler very easy. Highly recommended at £8.99.

Quickie
A rope ladder hangs down the side of a ship. The rungs on the ladder are one foot apart. At low tide the water just covers the bottom rung. At high tide the water level goes up by 3 feet. How many rungs will be covered then? The answer is not 4.

Prize Puzzle
In my house there are many cats. Seven of my cats won't eat fish, six of them won't eat liver, and five won't eat chicken. Four of them eat neither fish nor liver. Three of them eat neither fish nor chicken and two of them will eat neither liver nor chicken. One of them will eat neither fish, liver nor chicken, and none of them will eat all three foods.

How many cats have I got?

MARCH PRIZE PUZZLE
Not a very big response for this puzzle.

About 50 replies in all, of which 16 were able to give an exact answer to the problem. Incidentally, about 10 of the replies did not qualify for the prize since they were not on postcards. Please remember postcards (or backs of envelopes) only for your entries.

Several of the correct entries came from overseas but the winner, selected at random, was Mr Martin Brown of Worksop, Notts. Congratulations Mr Brown, your prize is on its way.

Mr Brown's solution was:

\[
X = 5476209930 \\
Y = 20000
\]

which gives the required value exactly.
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Benchtest: Commodore OC820/DB Benchtest: FMS 800/Checkout: Sour 1/ Centrington screen forms/Comsol/Logo/Brain Dump, UK101 M/C QUICKEN 4A, Hewlett-Packard 12C/Programs: 10K, Casso Corner: Casso FP 10 printer/Program: TRS-80 Maths & Trig, PET Boot the Cat, ZX81 Resistor & Res code

Volume 5 No 7 July 1982
Benchtest: Micro 801/Database Benchtest: Silicon Office/UCSD p-System/BBC Courtspeed/PCW Games: Pong/Calc Corner: T180/Programs: ZX81 Hypothesise/BBC Character Generator/TRS-80 Data/ PET Demo/ TRS-80 Screen Dump/UK101 Screen Converter/ PET Atari/Start Earth

Vol 5 No 8 August 1982

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"A good speaker and built-in noise get the Oric's sound off to a good start. Typing Zap, Ping, Shoot or Explode produces convincing arcade game noises which can easily be incorporated into any program."

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"One good feature of the Oric is an on-screen reminder in the top right hand comer to show that you've engaged all-capitals mode. So much better than the BB's variety of lights in the corner of the keyboard. The Oric is sound, simple to get along with and offers great expansion potential."

WHICH MICRO?

"This slope coupled with the design of the keys makes the Oric an easy machine to touch-type on. All keys have auto-repeat and there are four keys dedicated specifically to cursor control. It is certainly easier to type on than any of Sinclair's offerings."

WHICH MICRO?

"Oric will soon be selling a Modem so that Prestel will become available. Owners will be able to accept telesoftware - programs loaded straight down the phone line - eventually electronic mail could come into the home by the same route, and with the addition of a tape recorder the Oric with its Modem could become a telephone answerer and message taker."

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"When compared to the stogginess of the Spectrum's keyboard this is certainly an improvement. I can't see any Orics failing through bad assembly. If only the £2400 IBM were so easy to use."

WHICH MICRO?

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<td>150cps</td>
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<td>80cps</td>
<td>£211 + vat</td>
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<td>MX82A 120</td>
<td>120cps</td>
<td>£370 + vat</td>
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From today, we've got even more.

<table>
<thead>
<tr>
<th>Atari 400 and 800 Home Computer Technical Specifications.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour Capabilities: Choose from 16 colours, and 16 intensities (up to a total of 256 shades).</td>
</tr>
<tr>
<td>Sound: Four independent sound synthesers for musical tones and games sounds. Three and one half octaves. Variable volume and tone for each voice.</td>
</tr>
<tr>
<td>Display: Three text modes: 24 lines of 40 characters, double-width characters, or double-height, double-width characters. Nine graphic modes: from 40 columns by 24 rows up to 320 columns by 192 rows.</td>
</tr>
<tr>
<td>Memory: Includes a built-in 10K Read Only Memory (ROM). Operating System with 48K Random Access Memory (ATARI 800) and 16K Random Access Memory (ATARI 400).</td>
</tr>
<tr>
<td>C.P.U.: 6502B Microprocessor 0.56 micro-second cycle. 1.8Mhz.</td>
</tr>
<tr>
<td>Peripherals: A range of peripherals and accessories that are available now.</td>
</tr>
</tbody>
</table>

More of what home computers are for.

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<td>284-985k</td>
<td>360-720k</td>
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Bob Maund is co-author of 'The ZX81 Companion' and author of 'The ZX81 Companion'. He is a Senior Lecturer in Computer Science at Teesside Polytechnic, holds an MSc degree in Computer Science, and is a Member of the British Computer Society.

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The file area lists one file per line, by name, size, date of last change, and your description. If your files aren't on one screen, use the arrow keys to scroll through the list.

To move through the file list screen at a time, type N (Next Screen) or P (Previous Screen).

Issue one-touch commands.
"To make file operations, point the cursor at the desired file. SimpliFile will display the following single character commands."

A Back the file up to a backup diskette
B Rename a file
C Copy a file
D Delete a file
L List a file on your screen
M Make a file larger
P Preview a file
R Rename a file
S Sort the files
T Toggle the Multiple command on or off
V View the file contents in text or in hexadecimal.

Files can be sorted by name, type, or size.

And there's more.
"Files can be sent to any mail type or disk."

The Multi-file command lets you Backup, Erase, List all files marked M.

SimpliFile allows you to change the Current or Backup diskette at any time.

The Decision screen contains about which diskette you're working with.

SimpliFile maintains today's date. Typing T once, and it is never forgotten.

You can abort the action by hitting the (ESC) key.

You get the most of SimpliFile.

There are more.

You will never use CP/M utilities again.

SimpliFile will become your normal CP/M environment.

Looking at file descriptions and change dates.

Files can be sorted by name, type, or size.

Files can be moved from one diskette to another.

You get the most of SimpliFile.

With the Sort and Multiple commands, backing up files will become a pleasure.

SimpliFile will become your normal CP/M environment.

The Back command, you're moved in and out of programs easily.

You will never use CP/M utilities again.

Goodbye to PIP, STAT, ERA, REN, and DIR!

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Most people look to computers to perform specific tasks, whether it's the business user needing to produce a spreadsheet analysis, the archivist wishing to computerise files, or the games enthusiast looking for another Space Invaders. In every instance the solution starts not with the hardware, but with the software. Find the right software, and you've found the answer to your problems. Buy the wrong hardware, and your problems have just begun.

The logical approach to buying a computer is first to choose the program which performs the required functions and only then to decide on the hardware which will most efficiently run that program.

Clearly there is a need for a magazine which helps its readers do just that. A magazine that provides solutions, not problems. A magazine that considers the ever-increasing volume of software available and guides its readers to that which will best suit their requirements.

SOFT is that magazine.

The Writers
The Managing Editor of SOFT will be Dick Pounton, currently MicroScope's Software Editor and previously Managing Editor of Personal Computer World. SOFT's Editor will be Gareth Jefferson, MicroScope's present International Editor and a man with considerable experience in editing specialist consumer magazines. The contributors will include people of the calibre of David Tebbutt, Guy Kewney, Mike Liardet, Kathy Lang and Sue Eisenbach. With SOFT they will establish a new standard in microcomputer magazine publishing.

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SOFT is committed to reviewing more software in greater depth than any other microcomputing magazine. It will not merely make mention of the software package and documentation, it will thoroughly analyse every program in its entirety.

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<tr>
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<th>Price (+ VAT)</th>
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<tr>
<td>RX80</td>
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<tr>
<td>FX80</td>
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<tr>
<td>510</td>
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<tr>
<td>515</td>
<td>£1389</td>
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<tr>
<td>CP80</td>
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<tr>
<th>Printer</th>
<th>Model</th>
<th>CPS</th>
<th>Price</th>
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<tr>
<td>EPSON</td>
<td>FX-80</td>
<td>160</td>
<td>£365</td>
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<td>RX-80</td>
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<td>£275</td>
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<td>MX-100</td>
<td>100</td>
<td>£395</td>
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<td></td>
<td>TP-1</td>
<td>15</td>
<td>£415</td>
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<tr>
<td>TEC STARWRITER F10</td>
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<td>40</td>
<td>£1085</td>
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<thead>
<tr>
<th>Features</th>
<th>CP/M</th>
<th>MP/M</th>
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<tbody>
<tr>
<td>Time and Date Stamping</td>
<td>As Input</td>
<td>Automatic</td>
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<tr>
<td>Message, Length (Lines or files)</td>
<td>&lt;64000</td>
<td>&lt;64000</td>
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<tr>
<td>Text File Inclusion</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Specific or All Users</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Multi-Disk Access</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Record Locking</td>
<td>N/A</td>
<td>Yes</td>
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<tr>
<td>Multi-user Access</td>
<td>N/A</td>
<td>Yes</td>
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</tbody>
</table>

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<thead>
<tr>
<th>SPRINTERS Features</th>
<th>MP/M* Operating System</th>
<th>Multiple Printer Search</th>
<th>Multiple User Search (1-15)</th>
<th>Print File Priority</th>
<th>Printer Error Reporting</th>
<th>Time and Date Stamping</th>
<th>Alignment checks</th>
<th>Banner Message Print</th>
<th>Align Format from Print File</th>
<th>Status Reports at any time</th>
<th>Interaction from Command Line</th>
<th>Search Parameters</th>
<th>Configurable</th>
<th>Multi-user access</th>
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<tr>
<td>Multiple Copy (1-35)</td>
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<td>Align Formats from Disk File</td>
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<td>Restartable at any Copy Number</td>
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<th>Price</th>
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<tr>
<td>1</td>
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* All quotations from The Hunting of the Snark by Lewis Carroll
SINCLAIR AND ORIC COMPUTERS

UK prices are shown first. The bracketed prices are European export prices which include insured air-mail postage to all the countries of Europe including Norway, Sweden, Finland, Denmark, Spain and Italy. For overseas customers outside Europe an extra £5 postage per item is charged. Oric 800K computer £187 (£188). At last our new luxury versions of the 48K Sinclair Spectrum are here, with a full size typewriter keyboards enclosed in a tough larger plastic case which also houses the power supply and the computer PCB. Full-travel, gold-plated switch contacts with a life of 10^6 operations are fitted. Believe it or not these cost only a tiny bit more than the standard Z80 Z851 (E181). Spectrum Z852S are above but also fitted with a space bar and double sized shift and enter keys (£189). Standard Z8X Spectrum 16K £108-70, 64K £129-10, standard fitted with a space bar and double sized standard model. Spectrum ZXK £161.

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Let's start on a less scathing note this month by thanking the ACC for a card wishing us a happy fifth birthday. We'll now like to congratulate them on their tenth … and talking of fifth birthdays, a heavily vetted report on the PCW fifth birthday, held at the Planetarium in London W1, neglects to mention the more interesting aspects of this event. Journalists, important members of the industry and honoured publishers from VNU (PCW's owner), mingled in a great uproarious celebration which ended abruptly at 9.30pm, only after the champagne had run out. Naturally, the exhibition last year attracted 'a large percentage of directors and senior managers from a wide range of industries'. This 'class consciousness' could lead to a 'keep up with the IBMs' phenomenon taking over our computerised offices before long. How about company computers with vinyl roofs or managerial printout paper with watermarks! … Fed up with having your press releases or sales leaflets thrown out by your contemptuous public? Don't worry, we're sorry and all that, there can be one winner and only one … According to you, the readers, Horace games could involve the little char costumes of the royal corgis, neutering gay leopards (we take no responsibility for that one), suing Atari (or being sued by Atari), being a lawyer in the accidental case of Horace v Pacman, signing over the ultimate graphic, carefully left/right), Horace leads the SDP (using joystick to steer cars), Horace sends Eliza to a psychiatrist and Horace Sings Opera (making the most of the BEEP command). But the winner, by a pretty narrow margin has to be Horace – This Is Your Life: The ultimate graphic adventure! Struggle to remember people you haven't seen for years, your only clue being Eammon telling you which adventure you met them in. Answer impossible questions about your life, supply witty anecdotes at a moment's notice and keep smiling while some chap you're supposed to have been at school with tells everybody how you got drunk and fell into a river. Only after you have survived both depth and terrifying memories can you accept the 'Red Book'. Totally random questions and meetings. Not to be missed! Congratulations to Terry Kavanagh of Letchworth in Herts for that piece of wit rivalled only by that which features all the time in Chip Chat … £10 and copies of both Horace games will be on their way to you by the time you read this … Thanks also to all the other readers who joined us in having a laugh at Horace's expense. We hope he isn't too offended.


**BLUDNERS**

Fallible beings that we are, we admit our culpability for some recent oversights.

In the April issue we apologize for the stir we caused with the PET Billy program. Quite how this error occurred is a mystery both to us and to the author, but somehow two lines went missing from the listing despite appearing on the screen ok. Anyway, the following two lines should be added:

```
1210 INPUT $ @ 1210 INPUT $ @
1590 INPUT $ @ 1590 INPUT $ @
```

And the listing for 8066 Closing quotes missing after the full stop.

Andrew May of Burnham-on-Sea wrote to inform us that the assembler listing for the 'Printer Sprinter' was incorrectly printed with lines 71-99 placed at the end of the listing instead of at the end of the first column where they should have been.

In the May issue of Computer Answers we published a phone number for SBD Software (suppliers of Trackball joystick). The number we printed was 01-948-0461. It should have been 01-870-9275/870-9386.

We also forgot to mention which implementation of Pascal the MZ-80K was written under – it is in fact Hi-sof Pascal 3. Many thanks to Peter Dixon for pointing this out. Finally, we received a number of phone calls regarding the Oric Bug Eater listing. Taking the offending lines in order:

```
 1085 & 1105 The 'e' sign should be read as 'l' (shifted 3).
```

Computer printers always print the hash as a pound sign; this is something to bear in mind whenever you read a computer-printed listing.

1130 The 'J' is not an error, it's an Oric control character and should be entered exactly as it appears in the listing.

8066 Closing quotes missing after the full stop.

11076 The approximation sign after 'KEY' should be a string sign ($), thus: 11076 L=0:N$ + '=' KS=KEY:5:13=$

The following line should also be inserted: -- 3 HIMEM 13311

Meanwhile, we'll carry on striving for perfection. However, it's reassuring to know that you're all keeping on your toes!

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