THE PICK OF THE CROP?
Hitachi Peach and Apple III Benchtested
Cromemco System One

MicroCentre introduce Cromemco's new System One computer, available with an integral 5 megabyte Winchester hard disk, at a new low price.

The System One supports the full range of Cromemco interface cards, including high resolution colour graphics, and software packages. The choice of operating systems includes CDOS, CP/M and CROMIX—Cromemco's answer to Unix.

Call MicroCentre for ☐ Cromemco

MicroCentre Ltd (Complete Micro Systems)  Britain's independent Cromemco importer  30 Dundas Street Edinburgh EH3 6JN Tel: 031-556 7354
Portability

You can take an Osborne anywhere. It packs a desktop computer into a portable, weatherproof case. It has a sturdy carrying handle and weighs just 24 lbs. It works in the office, connects to a bigger machine and will travel with you to your home or to a remote location.

Power

The Osborne is a powerhouse of industry standard hardware and software built into one unit:

- Z80A 4Mhz processor
- 64K RAM memory
- 2 x 100Kbytes floppy disk drives
- 52 character ‘window’ display screen scrolling on a large screen of 128 characters.
- QWERTY keyboard with full cursor control and numeric pad
- RS 232C, IEEE interfaces

Osborne connects simply to a dot-matrix or daisy wheel printer and communicates with other micros, minis and mainframes. A 12 inch display and battery pack are optional extras.

Packages

The Osborne comes with six industry classic software packages:

1. CP/M. The VHS of micro operating systems. With nearly 300,000 installations worldwide just about every software manufacturer makes programs for CP/M.
2 & 3. WordStar and MailMerge are now the most widely used word processing and mailing packages on micros.
4. SuperCalc. A rows and columns tool that replaces calculator, worksheet pencil and pad. Even friendlier than VisiCalc and that became the micro industry best seller.
5 & 6. MBASIC and CBASIC. The two most popular languages on micros provide you with development capability and access to a further wealth of programs.

All the above software, normally costing about £800, is included in the Osborne £1250 (ex. VAT) price tag. In addition you can purchase from a list of many low cost packages including: Cardbox, DataStar, D BASE II, Spellguard and Micro Link.

Price

£1250 PLUS VAT
### Benchtests

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Do you feel you could get more out of your micro? Perhaps new software would improve things. Or how about expanding with new peripherals or more memory? Maybe you even need to upgrade to a better machine.

Then you can't do without Which Micro & Software Review, a brand new magazine which doesn't dabble in micros, it writes about nothing else.

We'll give you more software reviews (especially in the low-cost field) than any other magazine, with a unique buyers guide to software packages, that is updated every month. We'll tell you what's available for each machine, what's in the pipeline, what's right for you, where to get it, and what it costs.

We'll not stint on hardware coverage either. Not only will we publish the most extensive buyers guide section available but also reviews that take the machines apart. We'll compare cost against performance, point out compatibility problems, what's possible (and what's not), plus our best-buy opinions.

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By the first week in March, Exhibitors had already booked more space in the 5th Personal Computer World Show than the total on exhibition last year. It is absolutely certain now that the Show will be at least twice the size of last year's record breaking event. Possibly even three times the size or more.

Fortunately, the superb facilities at the Barbican offer us the opportunity to satisfy the staggering demands for space we are currently experiencing. The majority of Exhibitors have doubled their stand size in both sections of the Show which, like last year, will be divided into two floors. One floor will cater for professional and business microcomputing. The other will be devoted to home and hobbyist applications.

Massive stands have been booked or under offer from virtually all the big names in microcomputing. And a surprising proportion from foreign manufacturers!

Last year, the PCW Show brought more visitors to a microcomputing show than had ever been seen in the UK before. Sixteen thousand people in three days. This year the Show has been extended to four days and we are expecting record-breaking crowds.

Our promotional budget for the Show has been doubled and we are arranging the most exciting programme of features to attract the widest possible spectrum of visitors.

If your company is involved in microcomputing we strongly advise you to send off for details and reserve space now. The 5th Personal Computer World Show is already set to be a stunning success. Be a part of that success by calling Timothy Collins on 01-486 1951 today. Or use the coupon below to obtain a full information pack.

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<tr>
<th>Item</th>
<th>Price</th>
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<tbody>
<tr>
<td>Cassette Unit</td>
<td>44.95</td>
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<tr>
<td>8K RAM Cartridge</td>
<td>44.95</td>
</tr>
<tr>
<td>Joysticks</td>
<td>7.50</td>
</tr>
<tr>
<td>Star Battle ROM Cartridge</td>
<td>19.95</td>
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<tr>
<td>&quot;VIC Revealed&quot; Book</td>
<td>10.00</td>
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**TOTAL** £199.

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**HEWLETT PACKARD HP85**

Scientific and technical professionals favour the HP 85, they are being joined by increasing numbers of business professionals. Find out why the HP 85 is the professional microcomputer at your nearest Laskys store.

**HP-85 Computer - £2089**


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<table>
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<tr>
<th>Item</th>
<th>Price</th>
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<tr>
<td>Disk Drive Plus Controller (3.3)</td>
<td>429.00</td>
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<td>Disk Drive</td>
<td>339.00</td>
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<tr>
<td>Graphics Tablet</td>
<td>557.75</td>
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<td>Eurocolour Card</td>
<td>79.35</td>
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**TOTAL** £79.

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**APPLE III**

Apple III is a superbly powerful, professional micro-computer system. The sort of system that should only be purchased from a powerful and professional retailer like Laskys.

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<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
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<tr>
<td>Apple III</td>
<td>2899.00</td>
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<td>Disc III</td>
<td>439.00</td>
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<tr>
<td>Pro-file</td>
<td>2589.00</td>
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<tr>
<td>Visicalc III</td>
<td>169.00</td>
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**TOTAL** £2899.

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**SPRING SPECIALS!**

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<tr>
<td>16K RAM Card (48K-64K)</td>
<td>79.90</td>
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<td>280 Soft Card</td>
<td>199.00</td>
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<tr>
<td>Silentype Printer</td>
<td>225.00</td>
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**TOTAL** £289.

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**MICROCOMPUTERS AT LASKYS**

B PCW
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<tr>
<th>Product</th>
<th>Price</th>
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<tr>
<td>MZ 80FD Dual Disks</td>
<td>64.00</td>
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<tr>
<td>MZ 80P3 Dot Matrix Printer</td>
<td>41.75</td>
</tr>
<tr>
<td>NEW! MZ-80K Single Disk</td>
<td>459.00</td>
</tr>
<tr>
<td>TOTAL</td>
<td>644.00</td>
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</table>

**NEW!**

**SHARP MZ-80K CASSETTE SOFTWARE**

A whole new world of pulsating programs for your Sharp Computer now awaits you at Laskys. Available in easy-to-use cassette form, the new Sharp Software ranges from arcade games to Professional Word Processing. See the electrifying range now at Laskys!

<table>
<thead>
<tr>
<th>Software</th>
<th>Price</th>
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<tbody>
<tr>
<td>WDPRO-Professional Word Processor</td>
<td>45.00</td>
</tr>
<tr>
<td>Appalo-Word Processor</td>
<td>26.70</td>
</tr>
<tr>
<td>Cassette Database</td>
<td>33.90</td>
</tr>
<tr>
<td>ZEN Editor/Assembler</td>
<td>22.40</td>
</tr>
<tr>
<td>ZEN MOD</td>
<td>12.00</td>
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<tr>
<td>CESIL III</td>
<td>17.20</td>
</tr>
<tr>
<td>Music Composer/Editor</td>
<td>12.00</td>
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<tr>
<td>Camelot</td>
<td>6.30</td>
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<tr>
<td>Cosmecad 12K</td>
<td>9.20</td>
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<td>Home Budget</td>
<td>6.30</td>
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<td>Space Invaders</td>
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<td>Startrek</td>
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<tr>
<td>UFO</td>
<td>6.30</td>
</tr>
<tr>
<td>TOTAL</td>
<td>79.90</td>
</tr>
</tbody>
</table>

**NEW!**

**SHARP MZ-80B**

The MZ 80B offers world-beating versatility from Sharp. It is fast, powerful, superbly built, with up to 560K of storage memory, and probably the best graphics of any micro on the market! All this, plus a choice of 4 Languages, make the MZ 80B essential for your micro shopping List. See it now at Laskys!

<table>
<thead>
<tr>
<th>Product</th>
<th>Price</th>
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<tbody>
<tr>
<td>MZ 80B Computer 64K</td>
<td>1259.00</td>
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<tr>
<td>MZ 80 FD Dual Disks</td>
<td>639.00</td>
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<tr>
<td>NEW! MZ-80B Single Disk</td>
<td>459.00</td>
</tr>
<tr>
<td>MZ 80 P6 Dot Matrix Printer</td>
<td>499.00</td>
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<tr>
<td>MZ 80 EU Expansion Box</td>
<td>53.90</td>
</tr>
<tr>
<td>TOTAL</td>
<td>1259.00</td>
</tr>
</tbody>
</table>

**MICROCOMPUTERS AT LASKYS**

PCW 9
Osborne 1 is a new concept in microcomputing – the system-in-a-briefcase that you can take just about anywhere, and you can see it, try it, and buy it at Laskys, your friendly microcomputer store.

With a CP/M operating system, the unique Osborne 1 comes complete with £800 worth of software! CBASIC and MBASIC language for programmers and WORDSTAR, MAILMERGE and SUPERCALC for first-class word-processing, mailing, budgeting and financial-modelling. Add twin floppy discs, a 5" screen, full 64K memory based on a Z80 microprocessor with 64K Bytes of RAM as standard and you have a system that oozes pure class. Osborne 1 interfaces to an optional external monitor and to almost any printer.

TOTAL Osborne 1 Computer
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PRINTERS

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MX80 T Newtype 2
449.00
MX80 FT Newtype 2
449.00
MX100
649.00

Epson Interfaces
TOTAL
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Microline 80
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Seikosha
TOTAL
224.25
Seikosha GP80A
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97.50
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W1 9RD. Tel: 01-636 0843
Manager: Vass Demotis.

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W1 9RU. Tel: 01-229 6425
Manager: Vass Demotis.

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The excellence of its graphics truly sets the HP-85 apart as a superior problem solver. Not only the versatility, but also the outstanding resolution and clarity.

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Slough Crellon Electronics Ltd, Tel: Burnham 4300. The Xerox Store, Tel: 769596. Southampton Maths Box, Tel: 23958. St. Albans Albert Ltd, Tel: 74365/2. Sunderland Thos Hall International, Tel: 42447.
Tunbridge Wells D.J. Harrison, Tel: 214434. Woodford Automatic & Electronic Cates, Tel: 81571. Woking Datalect Computers Ltd, Tel: 69032. Worthing Office Machinery Engineering, Tel: 202382.

PCW 11
But the real beauty of the CompuStar is its "shared logic" design. Each user station contains its own microprocessor and RAM, the result is lightning fast program execution. Every word in the system, as well as the file architectures, print masks, and field structures relating to one record or a group of records on simply one permutation of the selection criterion, with a cross referencing facility as well.

The list is as endless as that which meets the requirements of your own imagination. The CompuStar 10 - a 32k programmable RAM* based terminal (expandable to 64k) is right for your requirements as a data entry or enquiry/response application. And, if you find it is not exactly what you expected, we will give you your money back. The Model 10 comes equipped with IDE busses and incorporates a unique controller which can accommodate up to 64k of RAM, a total of over one million bytes can be incorporated into the system to tackle even your most difficult programming tasks. But the real beauty of the CompuStar is its "shared logic" design concept. Each user station contains its own microprocessor and RAM, the result is lightning fast program execution. Every word in the system, as well as the file architectures, print masks, and field structures relating to one record or a group of records on simply one permutation of the selection criterion, with a cross referencing facility as well.

The CompuStar 10 Megabyte Disk Storage System (DSS) consists of read/write and control electronics, read/write heads, a track positioning mechanism, a spindle drive mechanism, dual drives, an air filtration system, and our exclusive 255 User Controller - all packaged in a compact desktop enclosure. Although designed primarily to accommodate multiple CompuStar Video Processor (Bios) described at left, the unit can be made to connect to a single SuperBrain Video Computer System to facilitate additional disk storage. When used with CompuStar VGO, however, the integral 280 based controller will act as up to 255 users to which the Microstar Series II Processor Unit and 5200s can be added;

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**THE NEW DBMS (DATABASE)***

**24 HOUR ANSWER PHONE - LEAVE ADDRESS FOR STANDARD INFORMATION PACK***

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<tbody>
<tr>
<td>02-Oki 80 + Intifce or Similar</td>
<td>476.00</td>
</tr>
<tr>
<td>03-Cable</td>
<td>25.00</td>
</tr>
<tr>
<td>04-Month Warranty</td>
<td>235.00</td>
</tr>
<tr>
<td>05-Delivery in U.K.</td>
<td>40.00</td>
</tr>
<tr>
<td>06-Training Session</td>
<td>50.00</td>
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<tr>
<td>07-CPM Handbook</td>
<td>8.75</td>
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<tr>
<td>08-50 Basic Exercises</td>
<td>0.75</td>
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<tr>
<td>09-Box Paper (100 Sheets)</td>
<td>25.00</td>
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<td>10-DMS2 (Database)</td>
<td>575.00</td>
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<td>11-Magic Wand</td>
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<td>12-MBASIC-80</td>
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<td>13-Super Calc</td>
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<td>14-40 Memorex Diskettes</td>
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<td>18-Instant Basic</td>
<td>9.00</td>
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<tr>
<td>19-50 Games on Disk</td>
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| NOT IN VAT | 437.50 |

| OUR PRICE | £295.00 |

**EXTRA SPECIAL SUPERBRAIN PROGRAM MAIL ORDER OFFER OF THE 5 MAIN PROGRAMS DMS2 + SORTS + MAGIC WAND + MBASIC 80 + SUPER-CALC NORMALLY 1140 POUNDS**

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**G.W. COMPUTERS LTD. 01-636-8210, 01-631-4818, TELEX 892031 TWGC**

**FUNCTIONAL CHARACTERISTICS**

The CompuStar 10 Megabyte Disk Storage System (DSS) consists of read/write and control electronics, read/write heads, a track positioning mechanism, a spindle drive mechanism, dual drives, an air filtration system, and our exclusive 255 User Controller - all packed in a "compact desktop enclosure". Although designed primarily to accommodate multiple CompuStar Video Processor (BIOS) described at left, the unit can be made to connect to a single SuperBrain Video Computer System to facilitate additional disk storage. When used with CompuStar VGO, however, the integral 280 based controller will act as up to 255 users to which the Microstar Series II Processor Unit and 5200s can be added.

**CAPABILITY OF BEING AT DIFFERENT TIMES, MANY DIFFERENT THINGS. THE ONE CORE PROGRAM CAN**

The CompuStar is a record relational as well as a file relational database management tool that is capable of being at different times, many different things. The one core program can be set up to perform tasks normally associated with the following list:

- **Accounting**
- **Budgeting**
- **Cashflow**
- **Stock control**
- **Address mailing**
- **Letter writing**
- **Simulations**
- **Time recording**
- **Filing**
- **Cale-type predictions**
- **Hospital indexing**
- **Profits analysis**
- **Census Bureau analysis**
- **General analysis**
- **Mathematics**
- **Employees records**
- **Tabulate values**
- **Print reports**
- **Sort files**
- **Edit records**

Within hours perform all the above in French or German.

The list is so endearing that it shows the requirements of your own imagination. Within the appropriate frames of reference you could ask questions like the following:

- Find someone whose name begins with W, who is either in London or Birmingham, and available for work at a salary of less than 10,000.00; and is under 40 years of age, not married, of 50 worthlessness, 1, with a car, prepared to travel, and who rides horses, does not mind the hours he works, is congenial and has good availability for work at a salary of less than 10,000.00; and is under 40 years of age, who at work and where treatment failed 23 years old, and who lives in London at a socio-economic grade higher than 3; do not smoke; have more than 3 children, are currently at work and where treatment failed to effect a cure in under 6 days. When you find such persons then print a list showing their age marital status, income, and frequency of illness in the past 2 years.

Currently you can ask 5 questions of 25 lines for a single selection criterion, and then you can compute 10 mathematical relationships between the questions for the individual as well as for the total number of matches. In all some 60 bits of information relating to one record or a group of records on simply one permutation of the selection criterion with a cross referencing facility as well.

Every word in the system, as well as the file architectures, print masks, and field structures, is capable of alteration by you without programming expertise (but with some thought).

**DATABASE MANAGEMENT+WORD-PROCESSING+MODELLING+DIY INTERPRETER+SERVICE**

<table>
<thead>
<tr>
<th>TWO TYPICAL PACKAGE DEALS</th>
<th>NORMALLY</th>
<th>NORMALLY</th>
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<tbody>
<tr>
<td>01-Superbrain 16K Ram 320K</td>
<td>1995.00</td>
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<tr>
<td>02-Oki 80 + Interface or Similar</td>
<td>476.00</td>
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<td>03-Cable</td>
<td>25.00</td>
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<td>04-Month Warranty</td>
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<td>05-Delivery in U.K.</td>
<td>40.00</td>
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<td>06-Training Session</td>
<td>50.00</td>
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<td>07-CPM Handbook</td>
<td>8.75</td>
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<tr>
<td>08-50 Basic Exercises</td>
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<td>09-Box Paper (100 Sheets)</td>
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<td>10-DMS2 (Database)</td>
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<td>11-Magic Wand</td>
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<td>12-MBASIC-80</td>
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<td>13-Super Calc</td>
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<td>14-40 Memorex Diskettes</td>
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<td>15-Dos and Diagnostics</td>
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<td>16-Might and Light</td>
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<td>17-Receiver + Autoload</td>
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<td>18-Instant Basic</td>
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<td>19-50 Games on Disk</td>
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<tr>
<td>NOT INC. VAT</td>
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</table>

| OUR PRICE | £295.00 |

**OUR PRICE + VAT**

**EXTRA SPECIAL SUPERBRAIN PROGRAM MAIL ORDER OFFER OF THE 5 MAIN PROGRAMS DMS2 + SORTS + MAGIC WAND + MBASIC 80 + SUPER-CALC NORMALLY 1140 POUNDS**

| OUR PRICE | £295.00 + VAT |

**WARRANTY NOTE**

We handle all repairs ourselves. Warranty covers free replacement equipment if defective in first three weeks. Thereafter up to 12 months the cover provides insurance on all spare parts and labour costs (excluding carriage).

**CALL OUT MAINTENANCE IS ALSO AVAILABLE AT £50.00 MINIMUM (LONDON) £50.00 MINIMUM ELSEWHERE IN U.K. PLUS MILEAGE.**
Selectric style keyboard contains 49 standard typewriter keys, 9 symbol or control keys, a
double-density providing storage of 3600Kb per drive for a total of 720Kb. The nkey rollover
board and floppy disks. The display can be operated as a 1920 (24 lines by 80 characters)
display, a 2Kb bootstrap PROM and an auxiliary Intel 8035 microprocessor to control the key,
Star's wide range of System and Application Software.

The North Star ADVANTAGE™ is an interactive integrated graphics computer supplying the
single user with a balance set of Business, Word, or Scientific Disc processing capabilities
along with both character and graphic output. ADVANTAGE is fully supported by North
Star's wide range of System and Application Software.

The ADVANTAGE contains a 4 MHz 280A® CPU with 546K of 200 nsec Dynamic RAM
work space for program storage, a 2060 600K RAM to drive the bit-mapped
graphics, a 2060 100K for 240 character screens, a single floppy 360K for application
to software to control the keyboard and floppy disks. The display is to be compared to a 1320 (16K by 90 characters)
plastic display or as a high density 1320. The keyboard is a standard 1320 with PS/2
connection to allow 232 communications ports for serial data transmission. And, a single board design to make

glare, specially focused 12-inch CRT for sharp images everywhere on the screen. Twin Z-80
detail. A full ASCII keyboard with numeric pad and user-programmable function keys. A non-
servicing a snap!

Whatever model you choose, you'll appreciate the careful attention given to every engineering
accounting, accounts payable, inventory of Word Processing, SuperBrain is tops in its class. And
SuperBrain's CP/M operating system boasts an overwhelming amount of available software in
programming power you will ever need... almost any type of 5.100 compatible bus accessory.

SuperBrain comes pre-installed in one of two configurations of available hardware in BASIC.
FORTRAN, COBOL, and ALL. Whatever your application... General ledger
Accounts Receivable, Payroll, Inventory of Print Processing. SuperBrain is tops in its class. And
in SuperBrain QD boil the same powerful performance but also features a double-disc drive
system to render more than 700MB of disk storage and a full 84G of RAM. All standard!

G.W. COMPUTERS LTD 01.636.8210, 01.631.4818, TELEX 892031 TWC

**BUS** WIDELY USED IN UK/FRANCE/USA AND ENGLISH SPEAKING COUNTRIES FOR ITS
OVERALL FLEXIBILITY AS A COMPLETE BUSINESS PACKAGE

Includes Inventory, Database, Management, Invoicing, Mailing Addresses, Statements, Sales/Purchase Ledger
with or without Auto Stock Update and Double Entry Journals including Ledger plus A/C Receivable
and Payable making Auto Bank entries.

SuperBrain Corvus DSK

<table>
<thead>
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<th>Model</th>
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<tr>
<td>64K x 320K</td>
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<td>64K x 700K</td>
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<td>64K x 1.5M</td>
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<tr>
<td>ADVANTAGE NSTAR</td>
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SYSTEM 1

64K x 6.3M DSK 2395.00
CRT AND Graphics CPM IN 1 'NUTRAB' UNIT

MBASIC 80 150.00
CIS COBOL 420.00
MAIL MERGE 55.00
DATAMART 190.00
DBMS (DATABASE) 475.00
DBMS (EXTENDED) 575.00
MSORT & DISORT 75.00

COMPUTERSTAR

<table>
<thead>
<tr>
<th>Model</th>
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<td>64K MOL 10 VPU</td>
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<td>BUS VER 8.0</td>
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<td>OKI MICRO 80</td>
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SYSTEM 2

64K MEGABYTE CORVUS MICRO-WINCHESTER & CRT ON 1 'SUPERBRAIN' UNIT

<table>
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<tr>
<td>BUX VER 983</td>
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</tbody>
</table>

For 1 Year Warranty Add 10% Hardware Cost, Maintenance Prices Please Call

24 HOUR ANSWER PHONE - LEAVE ADDRESS FOR STANDARD INFORMATION PACK

**East York Announcement**

Due to long term contractual commitments, we are only giving restricted demonstrations by appointment at one of our London offices. We
expect to all our contacts. Contact Tony Winter at 01.636.8210 or 01.631.4818 and if unavailable then call back message briefly
writing your telephone number and name on the 24 Hour answer phone, we call back anywhere in the world.

**IMPORTANT** NO HARDWARE IS ANY VALUE WITHOUT THE SOFTWARE, AND OUR SOFTWARE IS UNEQUALLED.
BUY A COMPLETE SYSTEM AND GET 10% OF THE HARDWARE COST IN FREE SOFTWARE.

PCW 13

GW Computers Ltd

SuperBrain has excellent performance for just a fraction of what it's meant to do. Standard SuperBrain features include: two double density mini-floppies with 350k bytes of disk storage. 32K of RAM memory (depending on EOM to handle even the most sophisticated programs, a CP/M Disk Operating System with a high-powered text editor, assembler, debugger and a disk formatter. And, with SuperBrain's 64K-15M bus, you can get all the programming power you ever need... almost any type of 5.100 compatible bus accessory.

SuperBrain, the CP/M operating system known for its compatibility and performance, has been taken to a new level of performance with the addition of two 84Gbytes of disk storage and a full 84G of RAM. All standard!

WHEREVER YOU CHOOSE, YOU'LL APPRECIATE THE CAREFUL ATTENTION GIVEN TO EVERY ENGINEERING
ACCOUNTING, ACCOUNTS PAYABLE, INVENTORY OF WORD PROCESSING, SUPERBRAIN IS TOPS IN ITS CLASS. AND
SUPERBRAIN'S CP/M OPERATING SYSTEM BOASTS AN OVERWHELMING AMOUNT OF AVAILABLE SOFTWARE IN
PROGRAMMING POWER YOU WILL EVER NEED... ALMOST ANY TYPE OF 5.100 COMPATIBLE BUS ACCESSORY.

SuperBrain comes pre-installed in one of two configurations of available hardware in BASIC.
FORTRAN, COBOL, and ALL. WHATEVER YOUR APPLICATION... GENERAL LEDGER
ACCOUNTS RECEIVABLE, PAYROLL, INVENTORY OF PRINT PROCESSING. SUPERBRAIN IS TOPS IN ITS CLASS. AND
IN SUPERBRAIN QD BOIL THE SAME POWERFUL PERFORMANCE BUT ALSO FEATURES A DOUBLE-DISC DRIVE
SYSTEM TO RENDER MORE THAN 700MB OF DISK STORAGE AND A FULL 84G OF RAM. ALL STANDARD!

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SUPERBRAIN'S CP/M OPERATING SYSTEM BOASTS AN OVERWHELMING AMOUNT OF AVAILABLE SOFTWARE IN
PROGRAMMING POWER YOU WILL EVER NEED... ALMOST ANY TYPE OF 5.100 COMPATIBLE BUS ACCESSORY.
We'd love to manufacture the game you've invented.
If we can tear ourselves away from it.

If your programme is compelling enough to glue us to our television sets, then it's just what we're looking for. And if we can leave it alone for long enough to produce it, we'll glue millions of other people to their sets as well.

THORN EMI is looking for video games and other general interest programmes, which have been produced for home computers from the following: Apple, Atari, B.B.C., Commodore, Sinclair or Texas Instruments.

Whether you're a professional programmer or competent amateur, if you have produced a programme that you think we may be interested in, we'd love to hear from you.

Please don't send the programme direct. Write to Home Computer Software Department, THORN EMI Video Programmes, Upper St. Martins Lane, London W.C.2. and we will send you an application form.

Leaders in home video entertainment.
dBASE II DELIVERS...

dBASE II is a relational database management system for CP/M micros – an information handler, not a mere file handler.

dBASE II harnesses the most sophisticated techniques to organise your data, the way you want it.

dBASE II is not an appendage to a programming language, it is a programming language, one that is in use, completely standalone, to support many applications, such as invoicing, stock control and maintenance scheduling.

Look at these features:

★ Fully interactive with easy X-Y cursor control and protected fields ★ Commands entered directly or stored as programs ★ Database structure easily modified and data copied to new structure in single command ★ Any number of indexes for each database ★ Full range of arithmetic, logical and string operators (e.g. single command to search for character string anywhere in particular field) ★ Powerful report formatting features.

WHAT A PERFECT COMBINATION...

An HD Superbrain with 12 megabytes of hard disc capacity built-in, dBASE II and a printer costs around £5,200 (depending on which printer selected). dBASE II alone costs £385.

For further details call: 01-950 0303

BOYD MICROSYSTEMS
59 High Road, Bushey Heath, Herts WD2 1EE
STANDARD FEATURES 400/800.
- 6502 central processor unit.
- 10K ROM Operating system, 8K ATARI Basic.
- Four game controller sockets.
- 16 colours each having 8 different luminosities.
- 4 sound generators with four octave sound range plus volume and distortion Controls.
- High Resolution graphics, 7 modes, highest resolution 320 x 192.
- Control for up to four disc units.
- Control for printers, peripherals and communication devices.
- Alternative languages, e.g. MICROSOFT, PASCAL, etc.
- Full screen editing.
- Plugs into your own television.

Tape deck—for 400 & 800 £43.48 excl. VAT. Joy stick controller £11.26 excl. VAT.
Le Stick £21.74 excl. VAT. Software Ask for details of our extensive range of software.

TERMS AND CONDITIONS: All goods sold subject to Adda terms and conditions of sale. Full details available on request, but include 7 day money back guarantee. Add 15% hardware warranty. Please allow 21 days for delivery. Allow 7 days for personal cheques to be cleared. Quoted prices are exclusive of VAT.
McCombo
The specifications speak for themselves!

Single board computer
Z80A (4 Mhz)
64K RAM
12K EPROM (including monitor)
4 serial RS232 (sync/async/bisync)
1 Centronics (bi-directional)
Facilities to add further disks (5¼ or 8")
8 timers (4 user addressable)
Hard disk option
IBM 3740/34 format

Designed and built in the U.K. after intensive research into the requirements of the micro market, the McCombo represents a breakthrough in the price and performance of CP/M based computers. By using the latest state of the art design, the McCombo offers specifications usually found on larger and more expensive systems. The McCombo is capable of conversing with mainframes and being CP/M compatible has a vast library of fully integrated software for most applications.

DESIGNED AND BUILT IN GREAT BRITAIN BY:

Prices start from:
£1088

2, Ganton Street, London W1
Telephone 01 734 9462/3
New distributors considered
Software for the Gemini Multiboard System

COMAL 80 — The extended BASIC with powerful PASCAL structures at £100

GEM PEN — A comprehensive text editor and text formatting package at £45

GEM ZAP — A very fast Z80 assembler with comprehensive screen editing at £45

ALL THE ABOVE AVAILABLE ON CASSETTE OR DISC

We've put together a microcomputer kit containing the Nascom 2, Nas-Sys 3, Graphics ROM, Bits & PC's programmers aid, Gemini 3 16K RAM Board and mini motherboard. The result is a powerful micro using market proven boards and components.

RRP OVER £405 + VAT

MicroValue's 'Nascom Special'

SHARP MZ80K with Super Graphics

The 48K RAM System is offered at a rock bottom price with the Quantum Micros Hi Res Graphics which gives resolution down to a single dot and high res. plotting. Characters are user definable and the pixel characters actually join. Five free games packages are included too!

RRP £645 + VAT

£345 + VAT

MicroValue price

£20 worth of accessories FREE with every Epson Printer

Epson MX80T ........................................ £359 + VAT
Epson MX80T F1 ..................................... £399 + VAT
Epson MX80T F2 ..................................... £465 + VAT
Epson MX100 .......................................... £575 + VAT

Buy one of the above Epsons from MicroValue and we'll give you a Pack of Fanfold paper, Interfacing Document and Connecting Cord for Multiboard or Nascom. The accessories are worth £20 but you can have them absolutely FREE.

Cheapest Printer in the UK!

Nascom IMP + Graphics

Only £199 + VAT

MicroValue has slashed the price of the 80cps, 80 column IMP dot matrix printer. And added Imprint's high res. graphics and double width character option. IMP has bi-directional printing and friction/tractor feed.

RRP £355 + VAT

£199 + VAT

MicroValue price

NASBUS Compatible DOUBLE DENSITY Disk System - Available Ex Stock

With hundreds in daily use the Gemini Disk system is now the standard for Nascom and Gemini Multiboard systems. Single or twin drive configurations are available, giving 350K storage per drive. The CP/M 2.2 package available supports on-screen editing with either the normal Nascom or Gemini IVC screens, parallel or serial printers, and auto single-double density selection. An optional alternative to CP/M is available for Nascom owners wishing to support existing software. Called POLYDOS 2 it includes an editor and assembler and extends the Nascom BASIC to include disk commands.

Single drive system (G809, G815/1) £450 + VAT
Double drive system (G809, G815/2) £675 + VAT
CP/M 2.2 package (G513) £100 + VAT
Polydos 2 £90 + VAT

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GEMINI GALAXY
A new CP/M system based on Multiboard

**HARDWARE**
- Twin 280A CP/M System
- 64K Dynamic RAM
- 80K Disk Storage (formatted)
- 80 x 25 Screen Format
- Inverse Video
- Prog. Character Generator
- 160 x 75 Pixel Graphics
- Centronics Parallel I/O
- Light pen interface
- 59-Key ASCII Keyboard

**SOFTWARE**
- Full 64K CP/M 2.2 with screen edit facility
- Comal-80 structured BASIC
- GEM-ZAP Assembler/Editor
- GEM-PEN Text editor
- GEM-DE BUG debugging software

**MicroValue Exclusive**
80 x 25 Video for Nascom

Nascom owners can now have a professional 80 x 25 Video display by using the Gemini G812 Intelligent Video Card with onboard Z80A. This card does not occupy system memory space and provides over 50 user controllable functions including prog character set, fully compatible with Gemini G805 and G815/G819 Disk Systems. Built and tested. **£140 + VAT**

**New Software for Nascom Systems**

- Portdos 1 A disk operating system for use with Nascom 1 or 2 and Gemini G805 Disk Systems. An incomparable and extremely well presented DOS that includes an editor and assembler and adds some common to the basic with BASIC. MicroValue price £65 + VAT
- Mathspak Double precision maths package on tape. MicroValue price £13 + VAT
- Mathspak Handler Used in conjunction with Mathspak. MicroValue price £9.95 + VAT
- Command Extender For use with Mathspak it extends BASIC's reserve word list. MicroValue price £9.95 + VAT
- Logic Soft Relocator An integrated assembler and disassembler package which allows assembly and disassembly from anywhere in the memory map. MicroValue price £13 + VAT

**SAVE MORE MONEY**

Standard Firmware for Nascom at Reduced prices

<table>
<thead>
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<th>Description</th>
<th>MicroValue price</th>
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<td>Nas Dis D-Bug (PRM)</td>
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<td>Nas Dis D-Bug (TPE)</td>
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<td>dBase II</td>
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<td>Apple Executive System</td>
<td>1950.00</td>
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<td>Apple-4K Video Output only</td>
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<td>Prototype/Hobby Card</td>
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<td>VisFile</td>
<td>98.00</td>
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<td>VisFile/VisPilot</td>
<td>135.00</td>
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<td>VisAuth.</td>
<td>80.00</td>
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<td>VisDex</td>
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<td><strong>LANGUAGES</strong></td>
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<td>Apple-Pascal Language System</td>
<td>225.00</td>
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<td>410.00</td>
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<td><strong>PRINTER &amp; ACCESSORIES</strong></td>
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<td>S viewModel Printer</td>
<td>170.00</td>
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<td>10 Rolls Thermal Paper</td>
<td>28.00</td>
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<td>17.00</td>
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<td><strong>VIDEO MONITORS</strong></td>
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<td>BNC 12&quot; Green Screen</td>
<td>120.00</td>
<td>18.00</td>
<td>138.00</td>
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<tr>
<td>9&quot; Black &amp; White Monitor</td>
<td>100.00</td>
<td>15.00</td>
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<td>Cables</td>
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<tr>
<th>ROM/RAM Kit</th>
<th>Price</th>
</tr>
</thead>
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<tr>
<td>8K ROM + 2K RAM kit</td>
<td>£140.00</td>
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<tr>
<td>8K ROM + 2K RAM Ass.</td>
<td>£174.50</td>
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<tr>
<td>12K ROM + 12K RAM kit</td>
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<tr>
<td>12K ROM + 12K RAM Ass.</td>
<td>£289.50</td>
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See pages 18-19

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Please send me details of the TP-1.
Newsprint

Edited by Guy Kewney

Still no software theft protection

Copyright for programs is as necessary as copyright for LP records, and just because copyright by itself has failed to end breaches of the law in music doesn't mean that it is useless. So I fully support the Council for Educational Technology in 'deploring the delay on copyright reform'.

The CET is referring to a recent Green Paper - a publication released by a Government for discussion, before a White Paper can be produced - on reform of the copyright laws.

I notice also that the Computing Services Association has produced its own suggestions on protection of software, a narrower field than the broad desire of the CET to know where it stands on technology and training. These suggestions include the laughable idea that, while copyright of programs 'at the high end of the market is necessary, at the low end it is not really possible'.

This Japanese plotter costs £2000 and is apparently capable of drawing complicated bar charts with a minimum of input. Distributor Trident claims that an 11-year-old schoolboy mastered its operation in under one hour and didn't need an operator, and there is nothing in law to stop him.

There should be.

Monopolise your micro

Derek Tidman, who tried to become famous as the man who was going to take on Tandy Corporation, now wishes to become famous for a version of Monopoly on the ZX81.

It looks like fun to me, at £6 it isn't really very expensive, and it only has one drawback: it doesn't allow cheating.

This is, surely, contrary to the spirit of the game! Whenever I was being beaten at Monopoly, my school friend Manfred always made sure that he didn't collect rent above and beyond my means, once he had forced me to sell all my hotels and mortgage key property! There was no altruism in this: he merely wanted to amass more money so that he could end the game with a bigger total. His aim, I think, was to break the bank as well as the other players.

On the Work Force (Tidman's company) version, the computer ensures, automatically, that all rents are paid.

Details from Tidman at Work Force on (0322) 418577.

Shop floor PET

Put a PET computer into a factory and you can't get your program loaded because the dust jams either tape cassette or disk drives. This discovery prompted Greenwich Instruments to produce a plug-in-chip which will automatically start running any program in one of its original inventions, the Instant ROM.

The Instant ROM is a memory chip which pretends to be read-only but is actually loadable with a program. The program is kept live with a very small battery while you plug it into the PET. And the new U-ROM & makes sure that when the power is switched on, the PET starts running the program in the Instant ROM rather than starting Basic.

And since this was developed for shop-floor applications, I suppose I'm safe in recommending factory managers to get in touch on 01-318 1510.

Cheaper

The distributor for the new TeleVideo CP/M micro-computers, Encotel, is justifying its recent appointment by telling anybody who cares to listen that the machines are cheaper than a Superbrain with the same specification. It's doing such a great job that it is probably well worth while telling everybody that Midlectron is the other official distributor.

Other European distributors are Microelectrologie in France, Microcomp in Italy, Data Dynamics in Spain, IDS in Germany, and Data Metrix in Finland.

Details from Televideo itself in Sunnyvale at 1170 Morse and more will follow 745 7760.

CP/M utilities

Programmers using CP/M systems need all the tools they can get to help them manage the beast. I certainly try to mention everything, whether or not it is any good. The list of CP/M utilities mentioned in a new catalogue from Gram Business Systems of Maidstone is definitely worth noting under this heading even though each program costs either just over or just under £50, so they aren't over-cheap.

Diskreviver is for getting into disks which either accidentally or on purpose have been erased or damaged, and recovering as much as possible.

Diskorganiser tidies up the mess of files that builds up on any floppy disk with time, as bits of files are written over the places between the gaps left by old files that are now deleted.

DiskDigger looks for grotty bits of the surface, collects them all into a single, indexed file, and makes sure that you don't try to use them. Theoretically, this allows you to use disks with holes in them, though I'd be nervous about that, since the chances are that the holes are due to old age and not damage.

With hard disks, you can't just junk one or two surfaces with a carefree 'oh, well, another £2 down the drain', can you?

Disked2 actually looks at data picked up by CP/M, and tells you what bits are stored on any floppy disk with time, as bits of files are written over the places between the gaps left by old files that are now deleted.

Details from Gram Business Systems of Maidstone or their catalogue from Gram Business Systems of Maidstone.

This Japanese plotter costs £2000 and is apparently capable of drawing complicated bar charts with a minimum of input. Distributor Trident claims that an 11-year-old schoolboy mastered its operation in under one hour and didn't need an operator, and it can store these pictures on ultra-mini disks, 3.5 inches in diameter. What it can't do (yet) is get its data from your data picked up by CP/M, and tells you what bits are recorded. It also lets you change things — providing you know what you're doing — so that you can recover.

Details from Trident's publicity office on 01-493 7535.
ruined files. Disklog is used to create complete 'completeness' files, says Grant — it makes sure that all characters going through the text are not written to disk. This could be program output, or just type text, or terminal input.

Finally, Diskspool sets up a queue of files for spooling to a 'list' device (usually a printer) and is claimed to be a 'list' very useful program. This could be program output, or just typed text, or terminal output. This could be program output, or just typed text, or terminal output.

Another IEEE interface

Whenever somebody announces a new Interface which they say is 'supported' by over 150 instrument manufacturers worldwide, it is usually because the French IEEE-488 bus outlet, I am told, has recently been used to introduce it to new readers.

I'm stuck with the old 'if you want to connect your instrument to a list device (usually a printer) and is claimed to be an extremely useful program'. This could be program output, or just typed text, or terminal output.
WHEN YOU HAVE 637 PROSPECTS TO REMEMBER
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Many people know Henry VIII had six wives. But few are aware of his 637 girlfriends. Poor Henry! Is it any wonder he laid about them with an axe. Just imagine trying to remember all those first names, addresses, birthdays, pigeon hole numbers and personal details.

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And he wouldn't have had to understand a thing about computers. CARDBOX looks like your favourite card index on the screen. You draw the card yourself. You decide where you want lines. You make up your own headings. And you fill in the details. At this point CARDBOX stops behaving like a flat inflexible card. It becomes multi-dimensional electronic paper. You can change any information you want. You can retrieve portions of information. You can print out all or selected information from your cards.

You talk to CARDBOX in plain English. You search your records on key words or on selected criteria. CARDBOX acts like a sieve, sitting through the records reducing the number until it finds only those that meet your needs. You display records on your screen or print them out in a format of your own design. Label production for mailing is simple. You can also use CARDBOX with some of your favourite wordprocessing packages, eg Wordstar.

CARDBOX works on most popular CP/M machines including those with special screens, eg Osborne. Use the CARDBOX Tutorial to learn all about this simple, fast aid to better record management. Study the detailed Reference Manual to take full advantage of its sophisticated features.

See CARDBOX at your local computer dealer. Or well send it to you with a dealer list. Call or return the coupon to us.
ambitious attempt to integrate office software is the one launched by the Bristol Software Factory. The big Commodore 8096, called the Silicon Office. This product, costing a mere £800 (gulp) appeared quite late in the day. The reason for this delay was that the company had been unable to supply an early model to the Bristol Software Factory. Now, I'm told it is working beautifully and I can happily inform purchasers that it is safe to use. Details on (0272) 277155.

**Video link**

Once upon a time, there was a little device called a Sony Responder, which could turn a video cassette recorder on and off, and find the right place in the film, and rewind or forward wind, and could respond to buttons pressed on its little keyboard. It was used as a teaching device, like this: it played a tape until it found a mark, and then it printed a little message on the screen, asking you to press button a, b, c, and so on. And the film was cleverly arranged so that, just before stopping, it would ask you three questions (or more), and the correct answer was button a, or button b or whatever.

The trouble with this device was fairly trivial - it couldn't display the question once the film stopped. So you needed a bit of paper to remember the question before you could work out which button to push. This seemed a silly omission to me, and I said so at the time.

You will therefore expect me to be pleased at the arrival of such a machine which can put messages on the screen and not only when it stops the tape, but while the tape is running, and either on top of the film, or instead of the film. This machine is not supplied by Sony, but by a Thai subsidiary called Scicon. And, indeed, the addition of a bit more software to do this is welcome, but whereas the Sony cost under £2000 (including a video tape machine) the Scicon Cavis (Computer Audio Visual Instruction System) costs well over £10,000. Scicon says it isn't after the mass market – I believe it. Details on (0908) 568656.

**Bananas**

The winner of our 'Just-for-the-hell-of-it' competition was Charles Horth of High Wycombe, Bucks. Congratulations, Mr Horth, you should have received your prize by the time this appears. Our thanks to the thousands of people who entered. The correct answer, which most people got, was: 'Phoebe this has got to stop it's driving me bananas'.

This appeared in the 'Patterns' logo at the top of page 91 of our December '81 edition.

**EATing chilli**

You can bet that if our own police authority, British Telecom, devised a system of using micros to see if you were really using our phones, it would keep quiet about it. But, however, in Mexico. In that country ('one of the fastest growing economies in the world'), the old fashioned system of having an exchange worker eavesdrop on your conversation is being replaced by a micro do it.

Apparantly, the motives are of the highest. According to an article in R & D Mexico (a public relations magazine), it seems, sent out by Mexican autho-

Although it looks like the lady has her thumb sellopped to file disks for the photograpb, those next aren't. Verbatim labels illustrate what the product actually does - it makes it easy to look through your box of floppies. The word from Willis Computer Supplies is: 'It has 10 sections, each with an ingenious, patented lift mechanism which enables disks to be displayed, five at a time, with just thumb and forefinger control for ease of selection.' It looks nice and so you would probably expect it to be expensive. Probably it is, since Willis hasn't told me the price and that's always a bad sign. Details from Willis at PO Box 10, South Hill Road, Bishop's Stortford, Herts. or phone agent Peter Blude on (0702) 568577.
possible to run SpellStar with WordStar. That is, the machine will have room for a program that examines the words stored by WordStar, to see if they are English words. At the moment, Osborne users have to use Spellguard. I've used it, and with a vocabulary of 10,000 words, (a lot, really) it misses so many of my common usages that I spend longer using it than I would going through the file myself.

Spellguard, unlike SpellStar, can't run together with WordStar. This means that while you are letting it look for words like 'words-like', you can't see where they occur in the text. And when it comes up with a word like FDR and asks you if you want that marked on the file as a mistake, it probably never occurs to you that it's the postcode for the ex-directory company of which you have no other record, and which you have now corrupted into FD[. Also, it is quite useless (as are all mistyping checkers) at spotting the occurrence of the word 'world' instead of ward. It's spelled right and the fact that it makes no sense in the paragraph means nothing to the program.

But at least with a program that works 'on screen', you do get to see the text again, and stand a bit of a chance of spotting these errors one more time through.

So, if SpellStar lives up to its reputation as having a bigger vocabulary, working on screen and running with WordStar, then the extra 100,000 characters on an Osborne disk will be worth it. Providing SpellStar is available, that is.

For those people who use the other major free (with the Osborne) program, Supercalc, the extra data storage will mean almost nothing, of course — with Supercalc, it's the internal electronic memory size that matters.

UK DR agent

Nice people though they are at Vector International, it doesn't help matters when you want to ask questions about the world's most successful operating system, CP/M, and find that you have to call a phone number in Belgium. And until now, that was the official European contact point for Digital Research, which produced CP/M.

Now, in the UK, the bunch to contact are the people in Southampton, at Xitan systems. Apparently, the deal was signed at the Microsystems 82 Show in Fulham in February. It's nice to know that something happened at that otherwise totally boring show, where almost the only new product of interest was a big micro called the IMP, based on the standard SI100 bus with the 68000 processor. When that is available, I'll write a bit more about it.

At first it saves me from having to report that the most significant development of the show was my laryngitis, a disability which caused an immoderate amount of quite unnecessary gigging from staid industry figures. Xitan is on (0703) 38740.

Nascom Basic extension

Suppose I were to list the 37 extra basic statements that Nascom users can get by buying a new Extension Basic program from Level 9 computing: would you read the list?

No, because the Editor would delete most of it as taking up too much room on the page. Also, most of you have probably heard so little about Nascom for the last two years that you've forgotten what a popular machine it became at its peak.

So, to summarise: you get essential editing commands such as AUTO, which says you having to type in line numbers when writing programs, and EDIT, which lets you change the line.

You get debugging help with commands such as DEC and HEX, which convert numbers like A3 to 163 and back, and XREF — which is only useful if you really understand it.

The really nice extras, for my book, are GET and INKEY, which let the programmer ask questions like 'Do you want to continue?' and respond to the 'Y' without waiting for the unastrued user to press Return.

I also like the idea of the command FIND, which can even find keywords — so you can look through somebody else's program, for instance, and find the next time he uses GOSUB 9000 or POKE 32,254. That would be particularly useful when you change a jump from GOTO 6000 to GOTO 7000, and can't remember if (and where) you did that jump before. You do get a RENUMBER command, which can sort out a lot of that sort of problem.

Purists will be glad to see 'structured' programming features — things like REPEAT...UNTIL and WHILE...WEND.

And finally, screen handling statements such as VDU, PRINT AT, WRAP, COPY, and LINE should save an awful amount of mucking about with complicated PRINT statements.

Level 9 warns that Extension Basic won't run with D-BUG or other toolkits 'as these can conflict with EB — but you won't need to'. At £25 in ROM or £15 on cassette, it sounds good value to me, and even if you have the ROM chip for only £12 if you bought the cassette version first.

Details, catalogues and so on from Level 9 Computing, 229 Huchenden Road, High Wycombe, Bucks, phone (0494) 26871.

Showtime

My delight at getting the news that Jim Alty of Liverpool University and Martin Healey of the University College, Cardiff, will speak at the 1982 Micro Show on 11-13 May is only slightly modified by the patronising tone of voice in which the announcement refers to 'other shows which concentrate on the toys and games market'. Alty is the most powerful academic figure in both orthodox mainframe work and new Microprocessor developments, sitting on or advising several official steering committees in Government and education. Healey is no less well known, and also sits on the board of a real British micro-mini system company, Future Technology. Both are well worth listening to.

Contrary to what you may think, I don't glory in the relative success of the show that this magazine runs each year (the PCW Show, which does include a section on toys and games as well as a section on business applications). The Online Show I actually have a slightly proprietary feeling about, having helped set up the first one four years ago. And it irks me seeing it restricted to a 'formula' — especially a silly one like 'business good, games bad' — which assumes business users don't need games, and games users don't
The bad news is we've had to increase the full subscription price of PCW to £11.50 for a year's supply.

The good news is that for a limited period we'll give you 14 issues of PCW for £11.50. That's two months' worth of Britain's largest selling microcomputer publication free!

The other good news is that you can now take long term subscriptions to PCW and save even more money.

A two year subscription is available at only £19.50 (you save £3.50). A three year subscription is available at only £29.50 (you save £5.00!). And remember, a long term subscription to PCW will protect you against future cover price and postal rate increases. Use the coupon below or the subscription card stuffed somewhere inside the issue.

Why do more people read PCW than any other microcomputing magazine in Europe? Subscribe today!!
**EPISODE**

The NEW compact 1.5MB Standalone Computer

£1995 + VAT

**NEWSPRINT**

Philips now has 'improved software' and 'lower prices' on its P2000 micro system, bringing the price of a word processing setup with a daisywheel printer down to around £3900 instead of £4500. Quite how good the software may be is difficult to judge, given that the new word processing package has a list of 'extra features' which read like the standard features of most word processors. And I don't recall Philips describing the software as 'primitive' last time.

But, clearly, it must have been. Details from publicist Jackie Murphy on 01-636 6561.

have businesses.

I would have thought it was obvious that anybody who can afford £500-plus for a computer just to play games on is likely to be fairly senior, as businessmen go. And for an awful lot of business users, the story of how they 'decided to automate the office, and first performed an evaluation scenario', etc, etc, is sheer self-aggrandisement.

What actually happened was that they wanted to play Space Invaders, and invented the office application to justify buying a toy. Only then did they find that the toy was really as useful as they were going to pretend. Having blown its lead in the market by going for 'the businessman' in the past, Online is now preparing the restriction but this time is aiming at the data processing professional. The logic of this (I imagine) is that Online conferences are well known in the professional computing world and that its publicity will be best directed through its normal outlets to that sort of person. In fact, the show will be of great interest to the average player and business user, though you'd never guess from the advance publicity.

Anyway, the show is at the Wembley Conference Centre, and you might just have time to get there, if you run. Online is on (09274) 28211.

Up and down

The hard part of building a super-microprocessor is not the impossible task of merely getting the circuit on a chip and working.

The really hard part is getting all the other special and wonderful 'peripheral' chips - memory management, disk controller, communications and networking, and so on - designed at about the same time, and working reasonably soon thereafter.

It has taken Motorola
all the resources it can muster to get its 68000 superchip working and word now starts to reach me that the vital memory management chip has at last been produced in a functioning form and that people building 68000 systems can get their hands on at least one, to test.

Motorola has absorbed the lesson, at any rate. It has just announced 'joint support' for the 68000 family of chips, together with two other chip makers, Signetics and Mostek. Some 15 huge chips are to be designed and built - some actually processors in their own right, others providing special extra abilities for control or processing applications.

Most significant is the decision to go small as well as big. Whereas Intel has made a killing with the 8-bit (that is, smaller and cheaper) version of its 16-bit 8086 micro by selling it to IBM, Sirius and the Japanese, Motorola's 16-bit 68000 has no 'baby brother' to scout out markets. This mistake is now being rectified. A giant 32-bit version is also planned.

The 8-bit version, the 68008, is supposed to be introduced this year, but don't ask me to hold any bets on the subject of when.

Final word

Last instalment of the WordStar manipulation saga, I hope, comes in the form of a letter from James Mowbray, who is professor of Immunopathology at St Mary's Hospital, London.

This user shares my frustration in being unable to use WordStar's search functions to find the end of a paragraph, but he has noted something which makes it possible. That is, almost all WordStar paragraphs end with a full stop, then a carriage return. Almost all the times you get a full stop then a carriage return, you find you are at the end of a paragraph, too.

Apart from adding that you also need to watch out for paragraphs ending with a quotation mark or question mark or exclamation mark, that system works amazingly well. And what I like about it is that it uses actual patterns of behaviour as its rule basis, not a blind hexadecimal search.

Naughty notes

Great care is called for in this mini-review of a software program, because I'm well aware that many of my readers are quite prone to complain if this column strays from industry and hardware news, and some of them regard anything, er, well, rude (shall we say?) as offensive.

The program I have been playing with is one I found at the last Compec show, innocently ranged among the Apple disk with programming utilities on the one hand, and the Space Invaders games on the other, on the SBD stand. It was the title that caught my eye: Soft Porn Adventure.

Normally, adventure games are based on the popular Dungeons and Dragons fantasy. Usually, in D & D, one player invents a world of magic, treasure and danger and the others pretend to roam around in it, searching for the treasures and trying to avoid his traps.

Normally, the computer is entrusted with the job of recording the world and the Yes, the Chable is only a monitor, but then again it is only £70. Don't count on your local store having it, or even wanting to have it - after all, they make more money on the sale of a Keiaga at twice the price. Details and availability information from Frank Chable, 3A Commercial Street, Batley, W Yorks WF17 8HJ.
Choosing a computer is more than just choosing a computer. That is, it’s a lot more than just hardware. Mind you, PET stacks up very well when it comes to the computer itself. Because at Commodore we’ve been involved with microcomputers for over 20 years – in fact, many other manufacturers pay us the compliment of using our microchip for their own computers.

So, when you choose PET you know you have a microcomputer that everyone in the business admires and respects.

Choosing software... Our software programs live up to the quality of our computer. The range, from both Commodore and specialist suppliers, covers everything from word processing, stock control and payroll to accounting and information processing. As well as specialist applications for education and the sciences.

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So, when you choose PET you know you have a microcomputer that everyone in the business admires and respects.
Some day in the not too distant future, your office -- or even a corner of your living room -- could look vaguely like this.

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actual joystick, a 'high quality one' he says, costs £15, while a joystick port adaptor is £20 and a power supply is £45.

Chris Curry, boss of Acorn, was heading off to Hong Kong last time I saw him, looking for cheap paddles and joysticks for Atom and BBC micro. But I still can't tell you how he plans to solve the problem of where to plug them in, because the expansion bus on the back of the Atom can't read paddles all by itself.

In the meantime, RP Shillito is at 5 Ingarfield Road, Holland on Sea, Clacton-on-Sea, Essex, CO15 6XA.

**Contract out on micro makers**

The Government is to revise its list of approved micro suppliers and has asked micro manufacturers to bid for contracts.

Back at the start of '81 the Government's Central Computer and Telecommunications Agency (CCTA) produced a list of nine approved companies, only three of which were British. Government departments wanting micros were limited to the products of these nine — although one of the British companies subsequently went out of business. Other British micro makers who weren't on the list were understandably piqued at being denied access to a large and lucrative market.

The original contracts ran for a year but have now been extended for a further 10 months, something which displeases the 'outsiders' even more as they'll have been cut off from the Government market for two years before new contracts are awarded. The CCTA has asked would-be suppliers to tender for contracts to supply machines in three categories. Category A is for low-cost, general purpose micros costing up to £2500 with twin floppy disks; Category B is for general purpose micros with twin floppy disks costing up to £6000 or with hard disks costing up to £15,000, with 'large amounts of memory', multi-user capability, interchangeable media capability, networking, graphics, standard operating system and 'ergonomic design'. The final category is for microcomputer systems costing up to £5000 which are 'more suited for still scientific applications'.

The CCTA intends to shortlist up to 40 companies by June and to award contracts by the end of 1982.

**Code cramming**

If Tolstoy was alive today and busily writing War and Peace, he'd probably be using a word processor. And he'd probably be worrying about getting all of his machine's disk. Cramming text onto a disk is always a problem when you're processing lots of words, and until now the only way to increase disk capacity has been firstly to use both sides of the disk, then use more tracks on each side, then pack the information more tightly onto each track. Eventually you reach the point where current technology simply can't squeeze anything more onto a disk, and that's where you have to stop.

Now, though, a University of Keele research fellow, Dr Dennis Andrews, has found a way to reduce the amount of disk storage space needed for text by up to 60 percent. He's done this with a very clever coding technique which compresses ASCII text files to about 40 percent of their original size. And he's marketing the program which does this, called E40, via a company set up for the purpose, Keele Codes Ltd.

E40 encodes (and of course, decodes) all 256 ASCII characters and versions will be available to run under CP/M and, later, 6802-based machines such as the Apple III and the BBC Computer; the CP/M package includes a utility allowing file transfer through a serial port — compressed text could be transmitted more quickly and cheaply through a communications system than normal text.

Exactly how E40 works is, not surprisingly, secret for the moment (presumably the curious CP/M user could have a go at working it out, though, and that's usually not a good sign. Check it out with Microvitec on 0274 390011.

More proof that a bog-standard CP/M system price is settling down at the £2000 mark comes from Quantum, a company which has ordered £250,000 worth of Gemini Multiboard systems, around which to build its Quantum 2000 at £2250. For the price you get three floppies with 2.4 megabytes of storage and a pretty screen, which isn't the world's greatest bargain but is reasonable value for money until the Sirius box hits its pages (that'll cost only £100 extra and offer much more power), or the IBM personal machine arrives 'officially'.

In case you didn't recognise her, this is round-the-world yachtswoman Clare Francis with her new word processor, an Apple III and the BBC Computer; the CP/M package was announced for E40...but watch this space!

Andrews.

Exactly how E40 works is, not surprisingly, secret for the moment (presumably the curious CP/M user could have a good go at working it out, though, and that's usually not a good sign. Check it out with Microvitec on 0274 390011).

Details from Gemini on 02403 2832.

In case you didn't recognise her, this is round-the-world yachtswoman Clare Francis with her new word processor, an Apple III and the BBC Computer; the CP/M package was announced for E40...but watch this space!

Andrews.
I wish I had a BBC Computer for each time I've been told how lucky I am to be able to spend all day every playing with all the latest micros; I'd have made mine Mine when a black-market rakeet by now.

From conversations with and letters from readers, I gather that life here in the PCW ivory tower is widely and enviously regarded as one long playtime, a sort of computerist's Utopia where we sit surrounded by every conceivable system, each forced into our reluctant hands by generous manufacturers for us to keep for as long as we wish. Occasionally, goes the myth, we force ourselves away from the keyboard for long enough to dispense words of wisdom by letter or telephone to those unable to find their way through the micro jungle, advising them on exactly which machine they should buy.

The reality is somewhat different. In fact those visitors who manage to reach the inner sanctum of our office, once they've got over the initial shock of just how incredibly untidy it is (we operate an open plan, free-format filing system here), are surprised to note a distinct absence of objects technological, particularly computers. In fact the only things we have which come anywhere near being hi-tech are the electronic telephones, the golfball typewriter and the coffee maker.

One would be excused for thinking that at the very least we would need and use word processors, but this isn't the case. Most of what you read in PCW comes from outside contributors, and is written by ourselves on our own machines at home. It would be utterly counter-productive for us to retype it all into a word processor before sending it - we use low-tech biros instead. Although we could probably find uses for computers around the office, we haven't actually done that route for a number of reasons, not the least of which is that, were we actually sitting on our machines at home, it would be utterly counter-productive for us to retype it all into a word processor before sending it - we use low-tech biros instead.

Many manufacturers are strangely reluctant to part with their products.

agree and then do nothing. A variation on this last one happens when a company's public relations person starts pestering us with letters and phone calls, asking us to test their wonderful new machine yet when we agree there's a sudden silence and the machine fails to materialise.

All this is why we arrange four or five tests every month, for we know that only a couple of the machines are likely to actually appear. If we really want a particular machine, we'll make such a pest of ourselves that we win in the end.

This naivety among micro suppliers extends into the sordid commercial realms of advertising, too. Unlike one or two other magazines, we keep a very definite separation between the editorial and the advertising departments. We must therefore make it a condition of a Benchtest that the supplier advertises with us and neither do we test a product because the supplier is an advertiser. In fact I'm frequently unaware whether a given company advertises with us or not as the first I see of the ads, when I bother to look at them at all, is when the magazine arrives from the printer. Sometimes we will work in the opposite way - the advertisement salespeople are told what is going into the next issue and they may contact the supplier of any equipment being tested and try and sell ad space to them, but the test will be printed regardless of whether he buys space or not.

We maintain this policy rigidly because we believe our readers are intelligent enough to notice when a magazine bases its editorial content around its advertisers and because to pandering to our advertisers would destroy the credibility we have built up over the years. Maybe it sounds a bit pious, but we think it's a principle worth sticking to.

After seeing the spec, reading the Benchtest and playing with the prototype for a couple of evenings, I was strongly tempted to scrape up the cash to buy a BBC Computer. Buying a Sirius has scotched that one for the moment, especially as the price rise (necessary, so it's rumoured, to give Acorn a profit on the beast) and in any case I would be purple with fury by now were I among the 12,000 or more who are still waiting for their BBC Computers. The trouble with a monthly magazine like PCW is that, by the time we hit the streets, any comment we make is probably long forgotten. We're like that surrounding the BBC fiasco is likely to be totally out of date. But machines are being delivered, albeit slowly, for I've had several conversations recently with people who have actually received their BBC Computers!

This business of announcing a machine, gathering massive backings of orders and then delaying on delivery is, it seems, endemic to the micro industry. It's an industry still in its adolescence, where the competition is cutthroat, the technology is progressing at a dizzying pace and in which many engineers and programmers suddenly find themselves running a wildly successful company with unbelievable growth rates which, because of their lack of managerial skills and experience, they simply can't control.

This is no consolation to the customer, of course, especially when, as has happened with the Sinclair ZX81 and the BBC Computer, the customer is likely to be a newcomer to the micro industry and expects to meet the well-oiled regularity of the more established industries. Hopefully, the BBC mess will eventually sort itself out, but I'm afraid the ZX81 and Acorn did, and hopefully this will be the last time we see it happening on this scale - but I rather doubt it somehow.

END
Now you can do all accounting with...

without...
Silicon Office is the latest microcomputer software program from the Bristol Software Factory. Designed specifically for use with the Commodore PET 8096, it'll help you run your office with the minimum amount of effort and maximum efficiency.

Think of it like three normal software packages in one, each separate package totally interactive with the other.

For around £4,500, you can have the complete electronic office, the solution to practically all your business problems. The price includes Commodore hardware, a high quality daisy wheel printer and Silicon Office software.

Silicon Office is made up from a flexible information management system which lets you create and maintain an extensive filing arrangement. Allowing you to search quickly through your records, making cross references between files in order to gain the facts you require.

A highly sophisticated word processing program allows you to generate letters, documents and reports. Letting secretaries get on with the more important tasks.

And a fully comprehensive calculator means you can handle all the number crunching you're ever likely to do in a business situation. Leaving the accounts department to concentrate on more profitable things.

But that’s not all by any means. Silicon Office also has a special programmability feature which means you or your dealer can expand and tailor the Silicon Office program to your business.

When Silicon Office is used in an everyday business situation, certain command sequences are inevitably repeated. By writing short, very simple programs which are entered into the computer's memory, Silicon Office can perform the necessary tasks, automatically.

And last, but by no means least is an optional communications facility.

It doesn't take much imagination to see the potential of Silicon Office in virtually any line of business.

So to get a better grasp, send away for our brochure. It'll only cost you a stamp. And it could save you a fortune. Or talk to your local Commodore dealer who has all the facts at his fingertips.

You'll soon see how you're much better off with Silicon Office. Than without.

I can’t wait to get my hands on a free copy of the Silicon Office brochure.

Name

Position

Company

Address

I own a Commodore PET (Please tick box) YES □ NO □

Send to: Bristol Software Factory, PO Box 14, Horley, Surrey.
To start at the beginning, it should first be observed that I have a healthy distrust of politicians. I tend to feel that by and large they are third-rate nonentities who have found a cute way of earning a living by exercising their vocal cords. There is, after all, ample evidence shown nightly on TV or heard on radio that this is so.

You just have to listen to Prime Minister's Question Time to know that a chimpanzee's tea party is far better behaved. But, then again, Parliament is there to lead us and it becomes easy to see where football hooligans get their basic training. It becomes fascinating to watch how more than 600 scintillating intellects and dazzling egos become meek and obedient lemmings in the face of the Party 'Whips' (I've always been deeply suspicious about the significance of that word).

But - and it is only an occasional but - sometimes one of those Parliamentary-type people seems to say something that is not only relevant, topical and newsworthy but also approximately sensible.

It happened recently in London. It was at a seminar and exhibition organised by the British Microcomputer Manufacturers Group for senior civil servants and the like from Whitehall, just around the corner from where the event was staged. The speaker was one Kenneth Baker, our Minister of Information Technology. He had been invited along to make the 'official' opening address by David Broad, chairman of the recently formed and increasingly active BMMG. I say 'official', for Baker was actually second or third speaker of the day, having already 'officially opened' something else before arriving at the BMMG show.

600 scintillating intellects and dazzling egos become meek and obedient lemmings

As with so many of these occasions (like the one earlier in the morning) the Minister began by intoning the standard mantra of Information Technology, together with some optional anomalies. For those fortunate enough to have never have heard of it, the mantra follows the pattern of how important IT is; how the performance of microelectronics brings the benefits of IT everywhere; how the Government is doing all sorts of wonderful things for the industry, the user and its own ratings by sponsoring things like Information Technology Year, the IT and Micro Awareness programmes and the Micos in Schools scheme; how it is important that children leave school in the sublime state of keyboard literacy; how there are to be 100 IT centres based on the excellent model of Notting Dale in West London; and how there will be funds made available for a national network of microcomputer centres like the one being run by the National Computing Centre.

Sitting at the back of the hall, I started to feel that I could chant the mantra along with the Hon Ken, and began to muse on whether this was the shortest route to Nirvana. I began to wonder what it would be like if I got there.

And then the Minister was suddenly off on a new tack, one that was quite interesting. It was also one that was not without its irony, for he gave the distinct impression that he felt sure he was speaking to an audience of BMMG members and similar people 'from the Industry'. Instead, of course, he was talking to civil servants. The new tack he followed was to tell the audience about what his advice to the civil service on Government purchasing policy would do for them. Some of them seemed to wonder as well. The advice, however, was interesting, not only for what was said but also for the fact that there was an underlying smidgen of understanding running through it; understanding of how the business works and what it is about. But, then again, the Minister used to work in the computer industry. Some Ministers have a live experience of their portfolio that extends to having fathers who were good on a pushbike.

Baker took as his thesis the fact that the public sector has a responsibility to harness its purchasing power to help the small but flourishing microcomputer
industry in this country. That purchasing power should be used to help the industry come up with internationally competitive products. It was very important, he stressed, for both the industry and the public sector purchasers to think in international terms.

So far so good, though this was an expression of a view that hardly showed a true sense of originality, given the overall complexion of the current Government. He went on, however, to explain how he felt the civil service would be able to achieve this.

First, he felt that the message itself was beginning to get through. This, of course, had been shown last year when the COTA selected some 'manufacturers' of microcomputer systems as the only way for the public sector to approach the introduction of new technology, he said. What was 'think British'. This was not a Buy British policy, however, he said. What was getting through was the message that was getting through to the management of the many British companies already in business, who found themselves to be actually formulating policies that brought in microcomputer systems as the only ones Government departments could purchase with approval. Most of them were actually distributors or OEMs for US-manufactured kits - much to the chagrin of the many British companies already in business, who found themselves to all intents and purposes excluded from a lucrative marketplace. This led directly to the formation of the BMMG which Baker was addressing.

He obviously felt that things had progressed since then, for he said that the message that was getting through was 'think British'. This was not a Buy British policy, however, he said. What he wanted to see the public sector doing was thinking in terms of involving the British manufacturers at the time they were actually formulating their requirements. This, he said, was the only way for the public sector to approach the introduction of new technology. Asking them to do two things at once is also the best way I know of giving civil servants a head crash, but no matter.

As a politician, he could have been justifiably argued that the Minister had said enough to satisfy honour and usual practice of over-specifying a system. This was a tendency, he added, that produces equipment that is usually totally unsaleable anywhere else in the world.

The wounds of experience seemed to show through again when he said that the public sector was now being pushed into telling manufacturers why they didn't get the business. He is currently trying to establish a system for this. Though it might bruise a few egos to be told that a product is actually deficient in some respect, it should do the product and the company no harm to be told. It could do some good, especially for some systems.

Despite the irony of the mistaken audience, Baker's remarks struck at an important area for the short-term future of both the UK microcomputer industry and the public sector. It is an area that offers enormous sales potential and could be the making of many British companies which can't be said to have made it as yet. It could also be the making of the public sector, that often allied group that is continually castigated for its inefficiency. Concentrated and enlightened purchasing policies that brought in microcomputer systems that had been engineered to do the job, but not over-engineered and consequently emasculated, could do wonders for such a tarnished image. It could also do wonders with the work. Maybe, if the public sector actually did get its act together, as the Hon Ken suggested, it could help other manufacturers join 'Uncle' Clive Sinclair in blowing high-growth raspberries at the world.

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Visicalc Utilities Apple computer program includes Visiread - Retrieve back-up disk (if bought of the same time)
You may be reflecting as you read this news that not a lot has happened since I last wrote. You'd be right since I submitted this copy two weeks earlier than usual.

I had a nice letter from John Kilburn from Shawfield Norden Community Middle School in Rochdale. I gave John a brief mention last month. This month he has written to give some details of what he's doing. ComptuerTown Rochdale runs from 6 to 9.30 pm every Monday night in the school. The main attendees are sixth-formers, although a fair number of adults come along as well. On their best night about 12 machines and 20 visitors turned up. The library staff at the school, Mr Ruislip has elected 15 May to be a Computer Day. A sort of open day will be held, with computers in profusion being available for the public to see and, providing demand isn't too high use as well. The show will be divided into at least three sections: Business, Education and Leisure. A number of local traders will be attending, as well as the schools and Eastcote ComputerTown. The day promises to be a very good one with something there for everyone.

One of the things we have learned from running ComputerTowns is that adults come along but go away again when they see hordes of children at the machines. This is a great shame but quite understandable. It may be that the open day approach will be more successful from this point of view. More news on this in the July issue.

Starting next month we're planning to include a 'Spotlight on Computer-Town...' in CTUK News. It will comprise a suitably photograph of the ComputerTown in action, with brief biographical notes and a list of the key volunteers. We have got the first two Towns lined up but we'd like to hear from your Town as soon as possible if you'd like to be featured. We feel that volunteers get precious little recognition and this is just one small way of redressing the balance.

John Bone wrote to me from Gateshead ComputerTown to say that the BBC dropped by recently while preparing background notes for a series later this year. They crawled all over ComputerTown, interviewed the volunteers and seemed very impressed by the work being done by John and his friends.

This same John was one of the mainstays of the ComputerTown stand at this year's PCW Show last year. This year he will be coordinating the ComputerTown section of the show. It takes lots of people to man such a stand, so please write or call John to volunteer your help for a few hours. Given enough volunteers, no one should have to put in more than a few hours. The show is 9-12 September at the Barbican Centre in London. You'll find John's address at the back of the magazine. His phone number is 0632 770036.

The man who organised last year's ComputerTown stand is Mike Baker. Unfortunately Mike's work has taken him away from ComputerTown (temporarily, we hope) and Chris Cooper has taken his place at ComputerTown Hanwell. Thanks for all your efforts, Mike, and good luck with the new job. If you live in the Hanwell area, Chris would love to hear from you. I understand he would be very grateful for some extra help. See the CTUK Centres at the back of this issue for his address.

Here's an interesting thought, courtesy of a recent visitor to Computer-Town Eastcote: 'Why not place all war games in the past, so that people consider the killing as something which used to happen rather than as something which will always happen?'

Alan Waring wrote to me to correct a few mistaken impressions I may have given in the March News: CT Guildhall is run on behalf of the City of London Staff Association, not the employer. In fact the Town's official title is CoLSA Computer Club and, in general, it is not open to the outside public. He also tells me that as far as he knows no one actually uses ZX-81s or Tandys in their offices. These are used at home. Glad to set the record straight, Alan.

It looks as if another ComputerTown will be starting in Hayling Island. Details are vague but it does seem that, like Guildhall and Renold before that, this will be for a company's employees.

And that's about the end of the news this month, apart from the list of ComputerTowns from which we've received letters:

- London (SW2, NW1 and SE15), Leicester (two letters), Rickmansworth, Peterborough, Luton, Nailsea, Rugby, BFPO33, Stanmore, Glasgow and Walton on Thames. The sharp-eyed among you may have noticed a steep increase in the number of letters from Walton-on-Thames. The fact is that the same person wrote twice. And I thought my memory was bad!

In a couple of days' time I'm off on my annual pilgrimage to Silicon Valley. Rumour has it that Liza Loop, the new technical coordinator of CTUSA, has some interesting ideas to discuss. Lots of news from there and here next month. Keep those letters flowing — and why not start your own Town? It really is quite easy and need only take up a few hours each month. I look forward to hearing from you.

ComputerTown UK! is an ever-growing network of computer literacy centres, where members of the public are given free access to micro-computers, courtesy of those willing to volunteer their time and equipment. ComputerTowns might be found anywhere: in a church hall, a library or maybe in a school after hours. The emphasis is on making computing enjoyable and non-threatening and, because Computer Town is entirely non-commercial, overt axe-grinding of any sort is banned. Guidelines are available for those interested in setting up their own Towns: Write to CTUK!, 7 Collins Drive, Eastcote, Middlesex HA4 9EL and remember to endorse a large envelope (A4 would be fine) for your reply. Please don't try to telephone PCW for information because this project is entirely a spare-time activity.

"There must have been a malfunction in the computer."
Save the ZX
In December's PCW you published a letter from Brett McBain ("Discussion of 'Kent'") about his problems with his ZX81. I was surprised to find that his problems were exactly like mine. Hence I concluded that my ZX81 was faulty as it had not saved and loaded programs in the four months I had had the machine. My conclusion was reinforced when a few days later I met someone who had a ZX81 which worked (1) - I viewed and loaded programs with my tape recorder (hence demonstrating that my tape recorder, a Ferguson 3T07, was a good mate for the ZX81). I have since got Sinclair Research Limited to replace my ZX81 and am pleased to report that my new ZX81 performs as per its advertisements.

I had a problem getting a reply to my letter as I had written to the repairs department (Dept FM). I have since been informed that Dept FM does not handle correspondence. So I suggest that frustrated ZX81 owners address their mail to the Sales Manager, Sinclair Research Limited, 3 King's Parade, Cambridge CB2 1SN. S M Parmar, Leicester

Happy returns!
W E Thomson of Aldeburgh may assure himself that some interpreters treat RETURN sensibly. The cruise round the old ROM interpreter for the PET saves both a line number and an absolute address for a GOSUB, and so does RETURN without searching. Probably any interpreter that allows multi-statement lines will do the same, but it is easy enough to check.

Enter this program:
1 GOTO 200
2) HETO 200 T=TI.FOR=FOTO999:
GOSUB 720
END

This uses the T1e facility of the PET — with other machines you may have to print something before and after the loop and use a stopwatches. On the PET you get either 133 or 132. Now change line 2 to GOTO 210 and GOSUB 2 line 210 to GOTO 200 and run again; on the PET you get 164 or 165.

Now comes the crunch: fill lines 100-199 with REMs, thus:
100 REM
101 REM
102 REM
199 REM

Run to get 540 and show that GOTO does search; change back to GOSUB and RETURN to get 133 or 132 again, thus showing that RETURN does not search.

If you have to print and use a stopwatch you will probably need to go more than a thousand times round the loop.
Dr E H Porter, Glasgow

Happy returns II
In answer to W E Thompson's letter (in the March issue) my UK101 version of Microsoft Basic (therefore all Microsoft's?) does what he suggested. For example:
1. A 'GOSUB' stacks the line number of the GOSUB and the memory location of the next instruction.
2. A 'FOR' also does this, and also stacks the STEP value for the loop, the limit value, the count direction (+ve or -ve), and the loop variable, the address of the variable's value, but this is not done, perhaps because then each FOR would stack 18 bytes!

The interpreter also has a line number search trick for 'GOTO'/"GOSUB" — if the high byte of the line to be found is greater than the current, the search starts from the current line rather than the first line.
Ian Cull, Welling, Kent

Submit!
There is a simple solution to the problem posed by Barbara Sanders (Computer Answers — March '82). It does not require manipulation of the BIOS or any other form of programming and provides the facility requested (unlike the solution provided by Sheridan Williams).

The answer is to use the CP/M SUBMIT command as follows:
1. Generate a file (say called 'FILE') with ED or MBASIC and insert a record —

M BASIC DATES
2. Rename the above file using REN SUB=FILE
3. Writing a file with no name but an extension of SUB
3. Rename the SUBMIT.COM file in a similar fashion — eg REN DATES.COM=SUBMIT.COM
4. Then the command DATES is typed, the file DATE.COM (ie, SUBMIT) will be loaded and executed and will search the directory for a SUBmit file with no name (since none was given on the command line). The command(s) in the SUBmit file will then be executed in the normal way.
S G Jenkins, Bristol

The problem was 'how do I create a file DATES.COM so that by switching on, inserting the dish and typing DATES, the program DATES.BAS will be run?' Ed

Please continue not to POKE
I was interested to read the discussions in both Communications and Computer Answerers in the February edition of your magazine as to whether or not you could PEek and POKe in a microcomputer, and whether or not it aids the 'advanced programmer'. The memory manufacturers gave the answer which was closest to the truth by saying that it has byte and word indirection like the Atom.

But, a word of warning. When a new computer comes on the market, the 'advanced programmers' start POKEing around inside and come up with all sorts of inside information which the manual doesn't tell you about that enables you to cut a few corners by PEKKing and POKeing. I have been guilty of doing just that on the Atom, but with the BBC machine, because of the way in which it is designed, you will soon come unstuck.

In any case there should be no need to POKE or POKE in, within the 16k of the machine operating system, Acorn has provided dozens of CALLs which should enable you to do almost anything you want to do including interfacing to all sorts of external devices.

One of the main reasons that Acorn advise us not to POKE around too much (I don't really think they are trying to hide anything, but you may disagree) is because of the Tube — a high-speed interface to a second processor. If you work through the given calls, then all your programs will work on the second processor without being rewritten. But I don't want to use a second processor, you say. Don't bank on it! At the rate at which this technology changes everything comes much sooner than anyone expects.

Listen, all you 'advanced programmers'! Don't waste your time POKEing around. The BBC machine has so many facilities within its operating system that it will take you all you want to sort those out and write articles explaining them to others. Then by the time you've sorted all that lot out you'll find yourself wanting to use a second processor, and the good habit you've developed of using calls instead of POKEs, will mean that ALL your programs will run on the second processor. You will have proved who really is an 'advanced programmer'! Paul Beverley, Norwich City College.

Another ZX maths bug?
I read with interest N Angel's 'Graphplot' program for the ZX81. It works on a similar basis to my own graph program, Easiplot, if any users will discover that they cannot enter "x**2" without getting an error code at line 130. On my ZX81, x**2 has to be entered as x times x ('*x**')... I thought at first that this was something to do with the VAL command, because it does a few unexpected things, eg, VAL " " will give an error code. After experimenting, however, I also discovered that VAL "-'" gave a result of -16 and that VAL "-4**" gave an error code. Using PRINT instead of VAL and omitting the quotes gave the same results.

Being one of apparently few people in possession of the original ROM fault, I wonder if this is another, as it seems a strange thing to be built in. Incidentally, I tried my original ROM (the faulty
Factors freak

Please could one of your readers with a home computer factorise: 15293518150231307603562650947764336561473047759334952669674419327902502427813913552893667295333414038749182183956525343383529990056038621529351816023130760356265094776433656147304775933495266967441932790250242781391355289366729533341403874918218395652534338352999005603862

Electronic democracy

I was interested in Ian Lloyd's article on electronic democracy in the March PCW; he asked for readers' comments, and I would be pleased if you could pass them on.

Many of the objections to voting by a cable television system (such as, should every voter vote — and when?) apply equally to the polling-booth system, and could be solved similarly, or ignored. After all, nothing stops people who haven't listened to all the arguments from voting at present! The voting period could extend over a length of time to avoid clashes with other commitments. Other difficulties could be overcome by hardware — eg, 'button-pushing parties' could be stopped by monitoring the cable inputs to check that more than the number of persons registered to vote on a particular viewer did so during the time allotted to a voting session.

Statistical criteria should be applied to the result. At present, say, a 55 percent with a 70 percent turnout could carry a vote — this is quite unacceptable. It would be reasonable to validate the decision, but only if the margin of error were greater than some margin of error — that margin being greater than the total percentage response. If the vote were indecisive, the government would proceed on the basis of its own judgement.

A vote by 'all the people, all the time, on every issue' would not be necessary. I envisage a system in which a government would contract to follow a broad declared policy, and have a free hand within that. Its decisions would be publicised, and put to general vote only if a significant minority of either the public or the government itself required this.

'The computer did it'

The statement that 'most people, on most issues, most of the time, don't want to be bothered' I found depressing. It is probably true, but I believe the apathy comes of being trapped in a tradition where most of the time, on most issues, most of the people have a little freedom of choice. Government is, to most people, something which just happens; willingly, I think the point about needing a responsive government is most important; if people had a choice more often than once every five years, if they knew that a government would be accountable to them if its actions strayed from the policy declared in its election promises, and if they could see the results of their decisions make real changes in the world, I think they would take a greater interest in politics; and naturally become better informed and capable of making responsible decisions.

R G Givan, Edgbaston

What use are they?

Each month you publish a page of basic information for the beginner. May I suggest that in addition to, or altering with, this page you publish a list of uses for the microcomputer, rigorously excluding games and commercial programs.

From personal experience I know that potential buyers are deterred by the apparently limited home uses. After all, not everyone runs his/her own business or wants to own a £400 TV game player. But both articles and advertising in computer magazines suggest that professional and amateur programmers concentrate on these markets.

Therefore the user will regard with favour a business which combines direct contact with the programmer(s) of a specifically relevant background within a support group drawing on a wide variety of experience.

K Tomory CA, 45 Moness Drive, Glasgow

Programmers' co-op

I have recently been involved in a short-lived business reviewing packages for the shortened accounting market.

This work has revealed two areas where commercial packages require to be improved.

a. Testing of software against realistic volumes of user-generated data.

b. Packages are designed by programmers remote from actual implementation of the packages.

These points are related to inadequate practical research, inaccurate documentation of the details, and designs which cannot be influenced by the eventual user (who represents the only real market for all the packages so far sold).

I propose to set up a computer cooperative program designer/authors and end users. The cooperative will ensure adequate standards of design, test and documentation and will provide a market place for business contacts.

The programmers will be recruited on agreement with existing programmers, eventually cornering most areas of the country and most commercially available hardware.

The cooperative will exchange employment for inexperienced programmers to enable development within a responsible and controlled training background. From my personal studies in program development it has been apparent that standards of writing are varied according to the main background of the author. If an author has a large-scale computer background then program writing will involve detailed planning, dry running (desk checking) and extensive written work.

If, on the other hand, an author has small-scale experience then planning is likely to be less detailed and development of the program(s) relies on machine running for the majority of the work load.

Turning to the end user, the choice of systems is bewildering to new computer users. One difficulty lies in the contact with computer "professionals". If a large supplier is involved then contact is likely to be with salesmen relatively ignorant of program development. If a small supplier of software is involved then the experience of those involved is likely to be quite restricted.

Therefore the user will regard with caution a business which combines direct contact with the programmer(s) of a specifically relevant background within a support group drawn from a wide variety of experience.

K Tomory CA, 45 Moness Drive, Glasgow

Would any interested parties please contact Mr Tomory, not PCW — Ed.
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The games I've been looking at this month all run on the well-established Tandy TRS-80 microcomputer. I was supplied with a basic Model I carrying 16k of RAM (it uses the Z80 processor) and including a CTR-80A cassette deck. This configuration would cost £399 (inc VAT) and plugs into a domestic television. The TRS-80 was an early entrant in the micro scene and has built up a considerable share of the market. It is a fully expandable and versatile machine and, though the lack of colour or high resolution graphics severely limits its capacity as a games unit, it has built up a considerable stock of this type of software.

Tandy has more recently brought out its colour computer, which I shall be looking at later on in the year, but on the Model I the graphics-oriented games are necessarily much less sophisticated than on the machines I have previously reviewed. Many of the games include simple sound effects which can be directed through a standard hi-fi system or — as in my case — you can use a mini-amplifier box which costs £7.49. I have looked at a varied assortment of games which I believe is fairly representative of the vast selection available.

This is a standard Adventure game set (as the name suggests) in and around an ancient pyramid. I have to admit it took me five hours even to get inside the pyramid, through the frustration of this served mainly to increase the satisfaction of my eventual success. Most of the objects and rooms inside the pyramid are much as you'd expect (a notable exception being the giant oyster!), though there are plenty of original problems for you to wrap your mind around. I would have expected a slightly more extensive configuration for the money and the 'astral guide' is a bit ingratiating and humourless compared with others I've seen, but nevertheless this is a well designed program from what must be considered an expert in the field. The package gives an 'average completion time' of one month. I'm not sure if how this is arrived at — but either way it's an exaggeration, I would think about 50 hours' continuous play is nearer the truth.

GAME: Pyramid of Doom
SUPPLIER: Adventure International
PRICE: £12.50

More of an entertainment than a game really — but unusual enough to demand a mention. Using simple alphabetic codes, you develop dance routines for a character looking more like a friendly alien than a demon, who inhabits a simple stage (the graphics are basic but effective). Fundamental tunes are superimposed on the performance, again using an alphabetic code (which is simple once you get used to typing 'A' for 'C' and 'B' for 'C#' etc). All in all you have 25 notes and 26 different stops to concoct a string of 248 action/note elements, and it's quite easy to create all sorts of bizarre results (hence giving your support to the 'Inane uses for new technology' lobby!). This one looks like it was originally written for sales demonstrations and later marketed to prevent salesmen giving it away with the machine. It does inspire overwhelming desires to give demonstrations to friends (neighbours, traffic wardens, cats — well anybody really!) and this, along with its novelty value, probably makes it worth the seven quid; although I'm sure I'd get heartily sick of it before very long.

GAME: Dancing Demon
SUPPLIER: Tandy
PRICE: £6.95

As you might expect, this program simulates ten-pin bowling. Given a view up the alley towards the pins, you line up a ball (actually a sort of chunky cross shape) on the base line using the arrow keys, and bowl it with the space bar. The manual claims that the force you exert can be increased by holding down the space bar longer, but I found that this had minimal effect. Once moving, the balls direction can be further modified and as it nears its target you can give it a limited amount of spin. Scoring is standard — each game consists of ten two-ball frames — and up to four players can take part. I was surprised that there is no facility for getting players' initials on the scoreboard since this is such a common and simple feature on games of this type and always adds to the fun, somehow. The graphics and sound are both as good as you can expect on this machine but the game itself is rather uninspired, both in design and execution.

GAME: Tenpins
SUPPLIER: Molinerx
PRICE: £9.50

VALUE FOR MONEY: **
PRESENTATION: *****
COMPLEXITY: *****
ADDICTIVE QUALITY: **
VALUE FOR MONEY: ****

This month Dick Olney reviews games for the TRS-80 Model I.

USE OF GRAPHICS: ****
PRESENTATION: *****
ADDICTIVE QUALITY: **
VALUE FOR MONEY: ****

LAY

PRICE: £9.50
SUPPLIER: Molinerx
GAME: Tenpins

USE OF GRAPHICS: ****
PRESENTATION: ***
VALUE FOR MONEY: **
real time action and rather poorly designed graphics. Status reports, long and short range sensor scans and power distribution are all displayed at the same time on a rather overcrowded screen — nice idea, but my feeling is that it makes the game less interesting. The battleground is a two-dimensional 10 x 10 matrix of 100 quadrants, and the object is simply to destroy as many 'Jovians' as possible. The standard beam and projectile weaponry (here referred to as 'Masers' and 'Triton' missiles) are complemented by 'Antimatter' pods and an experimental ray which — if you're lucky — can be used to destroy groups of enemy craft. One other interesting feature is the ability to control the power distribution between all the major ship's functions — thus making 'smart bombs' are activated by the '@' key. The latter destroy all aliens on the screen, though their remains will still obliterate you if you collide with them, giving the facility limited value. The response time, graphics and sound effects are all quite good, but if anything, the game is rather too easy. Admittedly I've had considerable practice with Defender, but I'm sure that most players would quickly tire of the tasks involved, particularly the tunnel.

The latest version of the old favourite. Your mission is to explore all 'M-type' planets in a section of the galaxy divided into 192 quadrants, killing any Klingons you might meet on the way. The galaxy is conceived as three-dimensional, thus giving an 8x8x3 matrix. All of the standard Star Trek features are included — short and long range scan, computer facilities, warp and impulse engines, phasers and photon torpedoes. You also have an option for 'alert stations', which in fact determines the power given to the deflector shields. The long range scan representation of a three-dimensional galaxy is confusing to begin with, as the most economical use of your energy. Movement and battle happen in real time, but because of the design I'm not sure that the game is necessarily enhanced by this attribute. All in all, if you want a game of this genre (which is undoubtedly the case), then you can probably do better than this one.

Astroball is a pinball simulator with standard flippers operated by two of the arrow keys. Despite the limitations of the machine's graphics, the screen layout is well designed and has all the types of targets and obstacles you'd expect on a pinball machine, including side lanes. The response time is more than adequate, and quite high scores can be obtained, especially as it's always possible to get extra balls. Five skill levels are provided to vary the appeal of the game. Even high resolution colour machines, however, can never really capture the full attraction of a mechanical pinball and — although, of course, few people actually have such machines in their homes — it's one of those games that I just don't feel computers do very well. Only real pinball addicts would want to buy this and even they might find it a poor substitute for the real thing.

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-Scroll your screen in the direction indicated.

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GAME: Vaults of Cymarron
SUPPLIER: The Software House
PRICE: £20

As the name suggests, this is an adventure game — but with a difference in that much of it is graphics-oriented real-time action with sound effects. The instruction manual, though clearly produced on a low budget, gives an amusing background to the game with illustrations that look like they belong in a 'head bangers' broadsheet. The game starts on the pleasure planet 'Babylonia' where, having sampled 'many of the grosser forms of self indulgence' available there, you find yourself heavily in debt (apparently exacerbated by the massive inflation rate). You are presented with a simple menu representing the planet's 'Presto' information service. Using this you discover the size of your debt and are made an offer by the 'Cred Mutual Assoc' allowing you to pay it off by retrieving some of the valuable artefacts contained in the Vaults of Cymarron (the remains of an ancient shopping precinct). You are allowed a limited amount of cash with which to purchase supplies from the pawnbroker, where a certain amount of bargaining takes place. Your choice of supplies is critical to the main part of the game, and above all it's essential to buy plenty of food. After visiting the pawnbroker you go on to the spaceport from where — having chosen the direction from which you will enter the vaults — you set off for Cymarron. At this point the screen of the program is loaded in from the cassette.

After choosing a skill level (which determines the strength of the monsters you are eventually plunged into the first room. Commands are entered using single keys such as 'L' for look and 'F' for fight, covering a fairly standard range of adventure vocabulary. All of the rooms are square with up to four exits and contain various obstacles, monsters (only ever one per room) and useful or valuable artefacts. You move your character with the arrow keys and can fire missiles with the space bar (assuming you bought a gun and needle pack from the pawnbroker). I would suggest that you save the game as soon as possible after entering the vaults, since otherwise if you get killed quickly you'll have to go through all the preliminaries again, which can be very irritating.

The vaults are quite extensive, so there's plenty to explore, though the game does rather lack variety. It is of course not as cerebral as your average Adventure game, and hence much less demanding; but the real-time action makes it less predictable the second time around, perhaps giving it a more lasting attraction. Vaults of Cymarron is not presented and well designed, if a little pricey.

Conclusion.
Undoubtedly the best offerings available for the TRS-80 are the classic adventure and Star Trek variants, of which there are many. These are rather more serious games than the arcade type real-time

craft on the screen, providing quite good manoeuvrability — though, unlike Defender, you cannot reverse or accelerate. The idea is to penetrate the various defenses, destroying as much as possible along the way, in order to eliminate a key figure at the end of your journey.

The game is quite simple to start with. You travel across mountaineous terrain scattered with ground-to-air missiles (which are constantly being fired at you), fuel dumps and other installations. These can be destroyed using a 'machine gun' firing volleys ahead of you, or with bombs which will fall to the ground slightly ahead of you, or with bombs which will fall to the ground slightly ahead of your firing position. It is essential to destroy as many fuel dumps as possible at this stage since this adds to your own fuel supply; and if you run out of fuel you're dead. As you progress, other obstacles appear — starting with a series of bobbing fireballs which you must either shoot down or attempt to navigate past. Eventually the area you have to fly in decreases in size until you find yourself in a maze containing completely vertical stretches which are very difficult to negotiate. At the end of this is your goal — a sort of robot-like figure — and if you destroy this the mission starts all over again.

The game relies much more on flying ability than destructiveness, and it takes some time to learn how to use the horizontal movement properly.

The graphics are very colourful (though rather lacking in crispness in comparison with some of the game's contemporaries) and there's a wide selection of unusual sound effects. Although Scramble is not a particularly fast game, there's certainly plenty to keep you occupied. The game enjoys a high popularity and although it's now disappearing from the arcades it can be found in many pubs and cafes.
In 1973-74, I recall The Sunday Times publishing a feature article entitled "The Rise of the Film-Flam Man" or something to that effect. For those of you who don't know what a film-flam man is, project into your mind's eye a door-to-door brush salesman with one foot in the door telling you that his particular brand of brush can be used for everything from brushing your toilet to cleaning your teeth (and probably both) because the bristles are made of superfineputthekettleon; as he tells you that the special cobalt-molybdenum case-hardened widgets reduce fuel consumption by at least 40 percent; or yet again, to think of a highly implausible situation, the guy in your local computer store who insists that you will need a 64K machine with Z80, CP/M, dual disk drive and dot-matrix printer for playing 'space invaders' with the kids at home.

Film-flammers are characterised by the tendency to spout jargon and important-sounding technical terms as a means of impressing, as well as intimidating, their unfortunate victims. You, dear reader, no doubt know the film-flam man by a more vernacular term...

How does one fight off this growing army of nelly-know-alls and smart-alecks?

That is far too coarse for me to use here, but it rhymes with 'pull bitter' because the film-flammer talks a right load of OBS!

This article, however, is not really about the computer store shark type of film-flam man (whooop! sorry, film-flam person). It is, rather, about a more recent phenomenon spawned by the micro boom — a phenomenon that usually lives on the user/enthusiast side of the fence. This breed of film-flammers (let's call 'em FF for short) exhibits a number of general characteristics.

They are political animals whose raison d'etre is to score points over others: they have a tendency to button-hole and eyeball.

They avidly read the computer magazines (surely there is only one? — Ed) in order to pick up the latest piece of jargon or tit-bit in order to keep 'one up'.

They sometimes concentrate on minute detail in a narrow field of interest, but often one finds a versatile FF willing to take on all comers.

They patronise those waterholes where they are likely to find suitable prey, eg, computer literacy projects, ComputerTowns, computer clubs.

They prefer to select their prey from among the organisors of such meetings on the basis that scoring points at that level should at the very least impress the natives.

The above characteristics are detectable through the various strategies adopted by the FF fraternity (alias Computerbores because they bore me stiff). For example, The Frontal Assault: 'I want you to tell me how to code the ZX81 in assembly' (sic); The Infiltration Method: 'Hmmm, A nice little program you've written. Tell me can you alter the clock on this machine?' (Faster than what? Who the hell cares anyway unless you are a hardware designer?); The Great-Bores-of-Today Commentator: 'Now he's pressing RUN. Notice the superb display on the green screen, the forty-by-twenty-five pixel array is really magnificent isn't it? And those characters with their true descenders! Look at those moving graphics! What's the memory map like on this machine?' (Aaarrrggghh!!); The Goody Advice: 'If I were you I would have written it in machine code' (Great if you know how to program in machine code, but otherwise deadly boring and tedious); and The Man of Influence: 'Right, now phone up Jim Smith at the computer store, go in and see him and mention my name. If you have any trouble, I'll sort him out.' (When you suggest that perhaps he would like to go and see Jim Smith in view of their great friendship, our dictator backs off at a million miles an hour with excuses about not wanting to abuse their friendship. Some friendship!)

Computerbores (or CBs — not to be confused with the airwaves variety) are thus a flourishing breed. They come in all shapes and sizes, even down to young bluebottles of the tender age of 12. The question facing the nation is: how does one fight off this growing army of nelly-know-alls, and smart-alecks?

My own empirical method centres on a little bit of reverse psychology: 'Great! You are just the man we're looking for to take over the job of secretary/publicity man/organiser (take your pick). It only takes up three evenings a week but to a man of your calibre it will be a pushover, a piece of cake.' This tactic works on most people because, as armchair computer experts, the last thing they want is the responsibility of actually organising anything. Perish the thought! I mean, if they were to be doing anything constructive they would become some other FF's prey. No, organising computer meetings, etc, is for the mugs.

However, I detect the first signs of a particularly virulent and resistant FF strain developing which I have prematurely dubbed 'sp Computer bore flimflamiensis, var khutzpahdhik' because not only is he a pain in the posterior he also possesses a confounded cheek. You know the type: knows all there is to know but at the same time criticises your humble club/Town/group for not providing him with instant help for his business problems — he expects a free consultancy service from you!

Well, I've had a good old scratch at a few character types and if I've drawn blood in the process — tough. The Computerbore shall not flourish and shall not inherit the earth. The film-flammers shall be cast low. Yea verily! OBS! CBFF TTFN.

The Rise and Rise of the Computer Bore

By Alan Waring

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School chip overkill?

Microcomputers have already begun to infiltrate classrooms, where techno-enthusiasts welcome them as the advance guard which will revolutionise the world. Fortunately, there are also people who are more concerned about the quality of education than the quantity of computing.

Questions are being raised, quite rightly, about the current full-throttle race into what I call COT — Computer Obsessed Training. COT starts with the uncontroversial assumption that computers are now an intrinsic part of society and therefore the nature and uses of computers should be an essential part of school curricula.

COT then leaps onto CAT (Computer Assisted Training) and makes elaborate claims about the value of computers as teachers. Super-COT then brings in even more trendy technologies, like video cassette and disks for interactive video teaching, to give further impetus to the computing bandwagon.

To be anti-COT is different from being anti-computer. The aim is to try to put computers in their rightful place — as a means to an end. The end is whatever people choose, rather than what the technological drive dictates.

Microcomputers in Education, edited by Christopher Smith, is a spotty contribution to the debate about the role of CAT and other computers-in-education topics. It has a few brightly shining spots among its 17 contributors but much of the rest is disappointing and the whole book lacks coherence.

Sparkling contributions come from Bob Lewis of St Martin's College, Lancaster, and a joint effort from Peter Goodyear and Annette Barnard of Aston University. Lewis used to be director of the pioneering Schools Council Project on Computers in the Curriculum and was a Reader in Computer Assisted Education at Chelsea (College, not Football Club). He summarises the anti-COT view succinctly: 'However quickly this technology develops, the real benefits will only accrue if we concern ourselves with its educational values.'

The key words here are educational values. Computers should be introduced into an educational environment to improve or assist with learning opportunities. Computer technologists may know how to write CAT or CAL (Computer Assisted Learning) programs. But, as Lewis points out, ‘Designers and authors of CAL materials should be first and foremost experienced teachers of the discipline; say, biology or geography.’

This fundamental fact needs stressing because it is so often forgotten by COT-blinkered computerists. That is why there is so much poor educational software — because the technological cart is put before the educational horse. As Lewis explains, ‘CAL materials are developed to add to the resources in the coverage of various curricula. It is the teachers of those curricula who know what kind of resources are likely to prove of value to students in the field.’

The question of trying to define educational values is explored in any depth in the book only by Goodyear and Barnard. Their contribution is made under the title ‘Microcomputers and Special Education’, although they discuss much broader educational questions than the use of computers to assist physically or mentally handicapped students.

In particular, they provide a timely warning about the direction being taken by the Government’s Microelectronics Education Programme (MEP). They accept that the £9 million being spent on MEP, coupled with the Department of Industry’s scheme to get a computer in every secondary school, will be of ‘considerable assistance to teachers and Local Authority advisers active in educational computing’.

But they warn that the MEP could ‘ossify current practices’ and could block out ‘child-centred’ developments in educational computing. They also fear that, after the initial burst of enthusiasm for computing by many teachers, there could be a backlash if the reality fails to meet the promises made ‘in a spate of evangelising books, articles and television programmes which made many a bold claim for the powers of the microcomputer’.

Goodyear and Barnard believe that the stimulus provided by MEP makes the prospects for extending current work ‘look good’. But in order to do so, the technology which is used in the work should be supported, they say, the MEP has been forced to create a well-defined ‘legitimating framework’ as the basis for evaluating projects. Once fixed, however, they fear this may not be sufficiently responsive to meet changing educational and technical needs. This, they say, will lead to an ossifying of the ‘current orthodoxy’.

In particular, they are worried that this ossification will occur at a time when most educational computing is what they call teacher-centred — that is, it takes as its model the activities of a classroom teacher — presenting information, testing, supervising drill-and-practice, keeping marks.

They would like to see a shift towards a more child-centred approach: ‘This takes as its model the child as a naturally able and instable learner and attempts to develop combinations of thought and action, allowing the child to use the computer as a powerful tool with which to explore and manipulate the world.’

Goodyear and Barnard fear that current teacher-centred approaches, reinforced by MEP, have been established just in time to create a barrier to more child-oriented developments. They sound a warning that containing an extremely conservative view of educational computing, need to be identified and resisted, they proclaim.

Having expended a great deal of scarce time and energy in installing and learning about computing and getting computers installed, they think that many teachers may feel that ‘some re- spite, and perhaps a little respect’ is needed.

This pause, against the background of over-ambitious promises, could mean, they say, that in the day-to-day routine of the classroom it is too easy for demoralisation to set in, and for the currently affordable microcomputing systems to constrain our imagination.

Unfortunately, these important themes introduced by Lewis, Goodyear and Barnard are hardly investigated in the rest of the book. I have given the views prominence because I believe they are the hard sinews around which a book entitled Microcomputers in Education should have been built.

In fact, the book is a lightly edited collection of conference papers, most of which were given at a PET Education Conference. This means there is an undue emphasis on PET systems and that many of the contributions read more like outlines of presentations than solid material designed for a book.

It was a conference when CBM was plugging Borge Christensen’s Comal language and there is an interesting paper in the book by Christensen on Comal. Another Comalite, Roy Ather-ton, also offers useful guidelines of some detailed standards that could be developed for Basic and Comal.

But a sign of the scrappy organisation of the book is that two other chapters in the part on languages are really about computer graphics. An interesting background summary of
CAI (Computer Assisted Instruction - yet another variation of CAT and CAL) appears in Chapter 9, which is primarily about the PET CAI system. Such a background piece should have come at the beginning.

In short, the book is structured around the contributions rather than trying to draw out the main concepts, background, developments, etc., into a more logical and thorough structure. There is, however, a sufficient variety of material in the book, including some case studies, to make it of some interest to those already 'into' educational computing. But I found it frustrating in its bittiness and in the way it allowed crucial questions to be raised without any real attempt to provide responses that would assist non-technologists to keep control over the technology and to provide some useful restraints on the COT rockers.

Got alotta Bootle

Stan Kelly-Bootle is a one-off, like most Liverpudlians. He is a court jester to the computer industry, a folk singer, a song writer (for the likes of Cilla Black and Judy Collins), a performing comedian — and an experienced computer professional with a track record leading back into the mists of the early 1960s.

His Devil's DP Dictionary is as unique and multi-faceted as Stan the Man himself. It isn't really a dictionary, although it is organised as an alphabetical sequence of word definitions. It is more a series of hit-and-miss jokes, observations, witticisms and asides, all steeped in the wry wisdom distilled from Bootle's computing experience.

Although structured like a dictionary the book can be dipped into and read at random. You are unlikely to use it to look up a reference to explain a word you do not know. For example, a program is described as 'A programme written in a lower-level language, such as American English; a sequence of detectable and undetectable errors aimed at coaxing some form of response from the system... plus more quirky remarks. In addition to these "one-liner" jokes, Bootle-Kelly-Bootle inserts longer anecdotes, shaky dog stories, poems and other bits, bytes and pieces. This format means that, like a "Monty Python" programme, there are many items that go on too long or miss the funny bone, but there is sufficient original, sparky material to make the whole thing enjoyable and memorable.

In addition to computer terms, Kelly-Bootle frequently bursts out into a general love of word play, for example, there is an entry for aibohphobia which is said to be a 'fear of palindromes'. Not to mention auto-eroticism, which is the "computer generation of best-selling novels". A fragment of a novel produced by the Playgol package is presented, with lines like: 'What a doll. A PhD in statistics, and she knew all the standard deviations... plus a few not in the textbook.'

Then there is the algorithms: 'A sudden, short-lived moment of pleasure enjoyed by the programmer (and, for all we know, by the system) when the final kludge rings the bell.' I could go on quoting until the KS come home.

It's that kind of a book. One which prompts you to nudge someone and say, 'look here, isn't this great?' It is quite likely, however, that one person's joke will be another's yawn. Kelly-Bootle has many 'in-jokes' for old computer hackers and a variety of historical and cultural references, so reactions to particular items will vary.

The mix, however, is so good that virtually anyone connected with computers will find something to laugh at; and even some enlightenment now and again. If it was closer to Christmas, I would recommend the Devil's Dictionary as the ideal stocking-filler for the computerist you love most. Don't wait that long. Here, for all we know, by the system) when the final kludge rings the bell.' I could go on quoting until the KS come home.

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BOOK FARE

alisations: Issues in the New Technology Debate. This is essentially a collection of edited papers from a series of seminars organised by an informal group of people (including myself). With the resources at our disposal, the results were inevitably patchy and it took a long time to get the papers together.

The issues investigated in most depth are ones like whether or not small firms will be the employment saviour of the ‘information age’, the scope and effect of unemployment, and whether work-sharing and shorter working time are effective ways of sharing out available work. There are many gaps in the book; many areas that need more study and other areas that are touched on only briefly, like the impact on civil liberties and the quality of life.

Beyond Generalisations’ main purpose, however, is to try to identify the issues and the generalisations clearly, and to illustrate that many glib solutions may have substantial drawbacks. At only £2, it could be a useful starting point for educational courses on the subjects and for researchers, policy makers and others looking for questions rather than answers.

Wrong recipe


Wrong recipe

Much of the output on TV about information technology has been propaganda for the technology. Programme after programme has spelt out the technical virtues of new systems, the benefits for improving productivity and an underlying philosophy which I call ‘technological rape’.

The essence of technological rape is similar to Margaret Thatcher’s economic TINA (There Is No Alternative). Technological progress is presented, consciously or unconsciously, as an unstoppable force with no alternative. Just lie back, and hope the pain will be bearable and that, when the hurting stops, the sun will shine again.

The BBC computer literacy programme, which I reviewed last month, does start to raise questions about the negative consequences of technology, but these are pinpricks against the general background of pro-technology gush, much of it from the BBC.

At last, there is a film which argues against technological rape and for a more democratic, people-oriented approach. New Technology — Whose Progress? from Education Media is a polemical ‘left wing’ film; but at least it makes no bones about its propaganda stance, unlike the pro-technology films which often purport to be objective and ‘value-free’.

As the use of word processors spreads, there is a growing need for books which assist the training of secretarial staff to operate the new systems. In Word Processing — Keyboard Application and Exercises, Arnold Rosen and William Hubbard claim to be providing appropriate ‘hands-on’ operator training in an easy-to-learn format.

Unfortunately, the book is disappointing. As a secretarial teacher new to word processing, I was expecting much more assistance. The glossary was useful but the introductory material failed to tell me much more than I have already learnt from reading manufacturers’ sales brochures.

Too much of the tutorial material for the student relies on referring to the operator’s manual of the machine being used. It is a bit like reading a recipe book which tells you to make home-made pie by using ready-made pastry and a can of pie filling.

The book is meant to be aimed at ‘a bright student of word processing, capable of making intelligent decisions’. Yet it is often too simplistic (like telling the student to first switch the system on). Much of the material presented seems to serve as a reminder to the student of things that should have been learned well in advance of being given a hands-on lesson.

Now,agit prop

As with Beyond Generalisations (reviewed elsewhere), the best use of the film is as a starting point for further discussion and investigation. If Education Media can get the money together, they may make further films. I hope they do. In the interests of democracy it is dangerous if the ‘alternative view’ is starved through lack of funds and outlets to reach a mass audience.

Sharp points

Software Secrets by Graham Beech is a book of Sharp tips. Although many of the ideas and techniques discussed are applicable to any system, all the code is for the Sharp MZ-80K, and therefore of most interest to Sharp users.

The full title expresses its scope — input, output and data storage techniques. The chapter titles summarise the techniques covered — screen I/O, interacting with programs, simple computer graphics, file handling fundamentals, sequential files and direct access files.

There is very little general discussion on the techniques before Beech leaps in, coding feet first. That is why Sharp users will find it of much more benefit than will users of other systems.

By working through the examples, the reader will be armed with practical experience of a variety of useful techniques. However, the book would have been more valuable to a wider audience if Beech had stood back from the Sharp end of things to discuss general concepts and theory before charging into code.

This month’s Bookfare included:

Microcomputers in Education edited by ICH Smith (Ellis Howood/John Wiley, £16.50).

The Devil’s DP Dictionary by Sean Kelly-Boole (McGraw-Hill, £9.95).

Issues in the Adoption of Microelectronics by J R Bessant and D E Dickson (Frances Pinter, £14.25).

Beyond Generalisations: Issues in the New Technology Debate edited by Colin Hines, Peter Bennett, Malcolm Feltu and Jennie Popay (Earth Resources Research and Polytechnic of the South Bank Town Planning Department, £2.00 — available from the Poly’s Town Planning Department, Wandsworth Road, London SW8 2JZ).

New Technology — Whose Progress? a film by Education Media, 2 Ridge Mount, Ridge Road, London NW2 (film £400 purchase, £17 to hire; video £100 purchase, £40 to hire).


Software Secrets: input, output and data storage techniques by Graham Beech (Sigma Technical Press/John Wiley, £5.95).
Alan Tootill presents more useful assembler-language routines. This is your chance to help build a library of general-purpose routines, documented to the standards we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another. PCW will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to 'Sub Set', PCW, 14 Rathbone Place, London W1P 1DE.

Our first item this month is not a Datasheet but an idea, from Richard Ryder of Macclesfield. Although described for the Video Genie/TRS-80, with characters made up from the standard 2 x 3 pixels, the idea can be implemented on any machine, with whole character positions in place of pixels, if necessary. This is how Richard describes the idea and implements it for the Video Genie in Z80 code: suppose one wants to display a spaceship with a revolving centre. The sequence of events to do this can be split up into six steps as in Figure 1.

The example shown is for a ship four characters long, but this could be reduced or extended to personal choice - the principle remains the same (eg, to produce an image with flapping wings simply change the first and last characters to produce a 'flapping' appearance).

If a counter is used ranging from 0 - 5 (for the example shown), then by printing the six combinations in quick succession, the ship will appear to revolve. Once the count reaches 5, simply reset to 0 and repeat the sequence. Using this technique, some quite interesting results are obtained.

The appropriate routine to produce the revolving spaceship described is shown in Listing 1. Initially, HL is loaded with the address of a byte containing the count, with the next two bytes containing the position on the screen to display the ship.

**Listing 1**

```assembly
DRALIEN:  LD HL,nnnn  ; Load counter addr in HL
          LD A,(HL)  ; Get counter into A
          INC HL  ; Point HL to screen pos'n addr
          LD E,(HL)  ; Get screen pos'n
          INC HL  ; into
          LD D,(HL)  ; DE
          EX DE,HL  ; Put screen pos'n into HL
          OR A  ; Is count = 0?
          JR Z,N1  ; No, then print graphics 166
          JR N2

N1:  LD (HL)+166  ; Yes, then print graphics 174
      OR A  ; Incr screen pos'n
      JR Z,N4  ; Is count = 0?
      OR A  ; Is count >=3?
      JR N3  ; Or is count >=3?

N2:  LD (HL)+174  ; Yes, then print graphics 174
      INC HL  ; Next screen pos'n
      JR Z,N5  ; Is count = 5?
      JR N6  ; Or is count = 5?

N3:  LD (HL)+179  ; Yes, then print graphics 179
      JR N7  ; Next screen pos'n
      JR Z,N8  ; Is count >=3?
      JR N9  ; Or is count >=3?

N4:  CALL IN1  ; No, then print graphics 187
      JR Z,N4  ; or 183
      JR N5  ; or 183

N5:  INC HL  ; Next screen pos'n
      JR Z,N7  ; Is count >5?
      JR N8  ; or 183

N6:  LD (HL)+179  ; Yes, then print graphics 179
      JR N7  ; Next screen pos'n
      JR Z,N8  ; Is count >=5?
      JR N9  ; or 183

N7:  CALL IN1  ; No then print graphics 187
      JR Z,N7  ; or 183
      JR N8  ; or 183

N8:  INC HL  ; Next screen pos'n
      LD (HL)+132  ; Print graphics 132
      INC A  ; Incr pointer
      JR C,N9  ; Is counter >5?
      JR N9  ; or 183

N9:  POP HL  ; Get counter addr into HL
      LD (HL),A  ; Save new counter
      RET

; IN1:  SUB B  ; Subroutine decides
       JR Z,IN2  ; whether
       JR IN3  ; to print 187

IN2:  LD (HL)+187  ; or 183
       JR IN3

IN3:  ADD A,B  ; Load counter addr in HL
       RET

; LOOP:  CALL DRALIEN  ; draw ship.
      LD BC,+5000
      LA B  ; do delay.
      JR N2  ; repeat.
```

To produce a reasonable effect, the routine should be called from within a loop, which includes a suitable delay, eg:

```
        LOOP:  CALL DRALIEN  ; draw ship.
              LD BC,+5000
              LA B  ; do delay.
              JR N2  ; repeat.
```

That is Richard's idea and, to satisfy myself that it could be implemented on any micro-computer, I produced the revolving space-ship effect on a standard Nascom. I used whole characters instead of pixels, with shape tables and

Dave Barrow's DIFA and DRAW routines, which were printed in the March '82 issue.

---

**Fig 1**

<table>
<thead>
<tr>
<th>Character</th>
<th>ASCII code (for Video Genie)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>166,179,179,132</td>
</tr>
<tr>
<td>0</td>
<td>174,179,179,132</td>
</tr>
<tr>
<td>1</td>
<td>166,183,179,132</td>
</tr>
<tr>
<td>2</td>
<td>166,187,179,132</td>
</tr>
<tr>
<td>3</td>
<td>166,179,183,132</td>
</tr>
<tr>
<td>4</td>
<td>166,179,187,132</td>
</tr>
</tbody>
</table>
6502 relative call

In the early pioneering days of this series (October 1980 and January 1981) we implemented and perfected relative calling routines for the Z80 processor. Our first Datasheet this month, from Gavin Every of Woking, gives a relative call routine for the 6502 processor. This is offered not only for you to perfect but also to test. (You guessed it! I am still waiting for my BBC Computer.)

Z80 bubble sort

Here is an interesting sort from John Hardman of Welling. What makes it interesting is that it can sort strings of specified length from within larger blocks of memory. It can therefore be used to sort multi-dimensional arrays. John uses the routine himself for sorting athletics teams into the order of their scores—the lowest score wins.

Datasheet

/• BRIEF: Bubble sort
/• CLASS: 2 registers not saved & references to absolute address
/• TIME CRITICAL?: No
/• DESCRIPTION: Sorts strings of any length into ascending order from within larger blocks of memory if required, on either one or two-byte keys.
/• ACTION: Set number of comparisons to go = number of strings less one.
/• Example: Sort string switch indicator
/• Compare each set of adjacent strings
/• Switch strings whenever first string pair > second string

pair and set switch indicator

1. Decrease the number of comparisons to go by 1.
2. Halt until a complete pass made without switching any strings.
/• SUB DEPENDENCE: None
/• INTERFACES: 16 bytes of directly addressed RAM, used for larger parameters or working storage and a further block of RAM, the length of one string to be sorted, used for temporary storage.
/• INPUT: The area of RAM to be sorted.
/• The following parameters set in RAM before the routine is entered:
/• NUMBER: number of strings to be sorted
/• START: address of the last char of the first string to be sorted
/• DISPL: the difference between the addresses of the last char of two consecutive strings
/• TEMPS: 2 bytes - the addr of STRP to hold 1 string
/• LEVT: 2 bytes - the addr of the program counter to be sorted
/• POSTN: 2 bytes - the addr of the string, numbered from the first string byte as 1 of the string sort key byte. With a 1-byte key, the last byte is the high order byte.
/• BIT: 1 byte - Set to 0 for a 1-byte sort key, else 1; 2-byte sort key is assumed.
/• OUTPUT: The area of RAM sorted.
/• Other input unchanged.
/• USAGE: RAD, BS,
/• STACK USE: 2
/• LENGTH: 14
/• PROCESSOR: 8080

/• STRIP: DEFS nn
/• WHEN nn -on-of chars in a string
/• HOLD: DEFS nn
/• START: DEFS nn
/• TEMP: DEFS nn
/• LEVT: DEFS nn
/• POSTN: DEFS nn
/• BIT: DEFS nn

Zeroise string switch indicator

1. Save all registers and M0, M1 (lo, hi)
2. Return addr = return addr + 1 (on stack)
3. Jump to calculated addr
/• SUB DEPENDENCE: None
/• INTERFACES: None
/• INPUT: The byte following the JSR RLVTL instruction to the address of the next byte following the displacement byte
/• ACTION: 0=8
/• Save all registers and M0, M1 (lo, hi)
/• Return addr = return addr + 1 (on stack)
/• Jump to calculated addr
/• SUB DEPENDENCE: None
/• INTERFACES: None
/• OUTPUT: The program counter is set to the address of the displaced routine to be executed
/• REGS USED: None
/• STACK USE: 8
/• LENGTH: 67
/• STATEMENTS: 131 to 139
/• PROCESSOR: 6502

RLVTL: PHP; ; Room for calculated var 08
PHP; ; Jump addr 08
PHP; ; Save 08
PHA; ; all 48
PHA; ; the 48
PHA; ; registers 48
PHA; ; on 98
PHA; ; the stack 48
LDA H1; ; from A5 ZE
LDA H0; ; space A5 ZE
PLA; ; on stack 48
CLC; ; Need binary mode
TEX; ; X=stack pointer
INC $0109,X; ; Inc return
BMI PE 09 01
BHE; ; address = 1, skip DO 03
INC $010A,X; ; displacement byte PE 0A 01
LDA A1; ; Move address 09 01
STA M0; ; from
LDA H0; ; byte to zero page
STA H1; ; and Y=hy byte
LRD #0; ; Load displacement byte A1 ZE
RLR L2; ; If negative 10 01
DEY; ; then decr hi byte 88
CPX #35; ; a plus 35
ADC M0; ; displacement 65 ZE
BC R3; ; to jump addr 90 01
IT #0; ; from
STA #0107,X; ; Store jump addr lo 90 07 01
TAY; ; BY 48
STA #0108,X; ; Store jump addr li 90 08 01
PLA; ; Recover 68
PLA M0; ; from
BNE #58 22
PLA; ; page 68
PLA M1; ; bytes 65 ZE
PLA; ; and 68
PLA; ; registers 68
PLA; ; stack AA
PLA; ; jump to subroutine 40

PCW 93
This short program shows how you can patch a special driver over the one existing in memory (make sure you don’t overwrite anything important!), but by changing addresses it can install the code any where you wish (providing you also patch the jump table). All sorts of frills could be added, but this is just to give you an idea. For instance, it might be useful to install a large driver at the top of the TPA, but as I haven’t tried this, I shall say no more.

**TRANSIENT CP/M BIOS PATCHING**

If your CP/M BIOS does not implement the I/O byte, there can be problems when you wish to use an alternative printer or other peripheral (perhaps your own printer has a parallel interface, but you have borrowed a daisy-wheel using RS-232 serial). There may be a suitable routine in the BIOS which you can access by simply patching the jump table, but you may find that a different driver routine is needed. The cleanest solution is to modify the BIOS (using SYSGEN, etc), but I have discovered the disadvantages of having a collection of disks containing variable operating systems. This short program shows...

---

**ZX81 POINT**

When moving a character on the ZX81 display using PRINT AT, it can be useful to know whether any other character is being printed over, for instance, a moving missile in a space invaders type game. This can be done by PEEKing the system variable held at 16398 and 16399, which is the present address of the cursor in the display file. When this has been found it can be PEEKed to give the character code of the character at the present screen position, as in Listing 2.

---

**UK 101 POWER-ON RESET**

This simple one-component modification lets UK101 (and perhaps Superboard) users have a power-on reset. Once fitted the computer will no longer display ‘garbage’ on the screen when first plugged in.

The only component required is a 10uF capacitor connected from ground to pin 40 of the 6502, ie, the reset. This capacitor acts to hold the reset pin down to ground for a fraction of a second, thus resetting the computer.

To fit the capacitor to the board carry out the following steps. The diagram refers to an area just behind the keyboard on the right side of the PCB.

1. Drill the PCB at the point X on the diagram.
2. Solder the capacitor (observing the correct polarity) to point Y.

---

**TABLE**

<table>
<thead>
<tr>
<th>ORG</th>
<th>100H</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOV</td>
<td>B, 12</td>
</tr>
<tr>
<td>LXI</td>
<td>H, CODE</td>
</tr>
<tr>
<td>LXI</td>
<td>D, 0025DH</td>
</tr>
<tr>
<td>LOOP:</td>
<td></td>
</tr>
<tr>
<td>MOV</td>
<td>A, M</td>
</tr>
<tr>
<td>STAX</td>
<td>D</td>
</tr>
<tr>
<td>INX</td>
<td>H</td>
</tr>
<tr>
<td>INX</td>
<td>D</td>
</tr>
<tr>
<td>DCR</td>
<td>B</td>
</tr>
<tr>
<td>INZ</td>
<td>LOOP</td>
</tr>
</tbody>
</table>

; This is where you may need to change the appropriate address to point to the jump table if you are not overwriting the existing routine.

**CODE:**

| RET  | 6 |
| ANI  | 1 |
| JNZ  | 0D25DH |
| MOV  | A, C |
| OUT  | 0 |
| MOV  | A, 20H |
| OUT  | 6 |
| RET  | END |

; Number of bytes to be installed
; Address of code to be installed
; Address of destination for code
; Get a byte
; Put into BIOS
; Bump both...
; Pointers
; Decrement byte count
; Repeat until finished

---

**Steve Withers**

---

**Andrew Esmond**

---

**Listing 1**

```
1000 REM ROUTINE TO FIND CHARACTER AT THE PRESENT SCREEN POSITION
1010 PRINT AT X,Y;
1020 REM X & Y ARE THE CO-ORDINATES TO BE TESTED
1030 REM THE SEMICONDUCTOR STOPS THE CURSOR MOVING TO A NEW LINE
1040 LET P=PEEK(PEEK 16398+256*PEEK 16399)
1050 REM P CONTAINS THE CHARACTER CODE OF THE PRESENT SCREEN POSITION SET BY X & Y
1060 REM REST OF PROGRAM
```

**Listing 2**

```
3. Scrape off the insulator on the bottom track near to point X.
4. Bend the capacitor’s wire to the track and solder.
```

---

**A B Davis**
ZX81 STRING ARRAYS

ZX81 owners who use string arrays will be aware that they have one major limitation. In a 10,20 array, for example, each of the 10 strings is padded out with spaces to the full 20 characters. While this does make true alphabetical sorting simple, it carries with it the disadvantage that the true length of the original string is now disguised. Any attempt to use such strings as part of a block of text will result in a string followed by a number of unwanted spaces. It is, of course, possible to examine each string character by character to determine its true length but this can be very time-consuming.

A more elegant solution is to include a string length indicator (SLI) as part of every string to be placed in an array. This can be achieved as follows (where A$ is a string about to be stored):

```
LET A$=CHR$(LEN A$+1)+A$
```

Provided the original string was less than 255 characters, it now has an SLI in position one, recording its true length.

An array of such strings can be sorted alphabetically by comparing only the characters after the SLI, eg, A$(X,2 TO) but it is now also possible to sort by string length simply by comparing the whole string, including its SLI.

To use the stored strings within a block of text, simply use the following instruction, which will return the original string stripped of its SLI and any padding:

```
PRIN A$(X,2 TO CODE A$(X,1))
```

It is also possible to use this technique when storing data in long strings. Provided that individual items within the whole are less than 255 characters, an SLI at the beginning of each item provides most of the benefits of a pointer array, allowing a fast scan along the data without the necessity to search for special separator characters.

David Lawrence

ZX81 READ AND RESTORE

The ZX81 manual describes the function of the READ and RESTORE statements found in most Basics and explains how to overcome their absence on the ZX81. However, the method used isn’t entirely satisfactory as RUN destroys all the variables. The statements may easily be emulated using existing commands as in the listing here.

```
10 DIM A(6)
20 LET N=0
30 LET A$="ITEM1,ITEM2,ITEM3,ITEM4,ITEM5,ITEM6"
40 FOR M=1 TO 6
50 COSUB 1000
60 LET A(M)=VAL B$
70 NEXT M
```

This subroutine called by line 50 initialises the intermediary B$ and increments and pointer N. The data is then loaded into the array A by line 60, converting it to numerics using VAL. A major advantage of this routine over previous methods is that the data items are not limited to a fixed number of characters. Also, because the data is held as a string, it may be mixed numeric and alpha with suitable amendments to lines 10 and 60. Several arrays may be loaded by extending A$ and using lines 40 to 70. The pointer N holds the current position in the data string and therefore the RESTORE function consists simply of setting N to zero.

J H Whittaker

PET EPROM MOD

I would refer to the item ‘EPROM Programmer for PET’ in the February 1982 PCW, as some of the advice given differs from that given in the Intel 1979 Component Data Catalog.

The circuit diagram in Fig 3 shows Vpp as 26 volts whereas Intel gives the DC programming characteristics for Vpp as 25±1 volt; note that care must be taken when switching Vpp to prevent overshoot exceeding this maximum specification.

The sequencing of the application of the voltages to the 2716 is the reverse of that quoted by Intel, which states Vcc must be applied simultaneously or before Vpp and be removed simultaneously or after Vpp.

Intel also states the 2716 must not be inserted into or removed from a board with Vpp at 25±1 volt. It is appreciated that other manufacturers may have 2716s with slightly different characteristics, and I would suggest that a check on the data sheet is advisable.

The problem can be overcome by rearranging the switching as shown in Fig 1. The second switch in the Vpp line is provided in case the two poles of S1 do not make simultaneously.

It would appear that the circuit could be easily modified to program Intel 2732s (but not 2532s as the pin out differs from that of the 2716). To do this it is necessary to make use of the spare address output D of IC 6 as A11 and provide a double pole two way switch and a condenser of 0.1 microfarad from Vpp to ground. The addresses in the machine code program will need to be modified. The suggested arrangement is shown in Fig 2.

For anyone thinking of building the circuit it could be worth considering reducing the chip count by replacing the three 7493s with one 4040, a 12 stage ripple-carry binary counter, and the two 6T26 with an octal bus transceiver such as the Intel 8286 or the 74LS242/3.

J H Whittaker

Figure 1 Modified switching for EPROM Programmer for PET

Figure 2 Modification for EPROM Programmer for PET
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dBASE II: A DATA MANAGEMENT SYSTEM UNDER CP/M

Kathy Lang continues her series of database reviews

dBase II gives users of CP/M systems the ability to store, process and access data in a wide variety of ways. It has a clean, well-constructed user image, making it unusually easy to learn and use even its most powerful facilities. The authors call it a relational data base management system but, strictly speaking, it is a 'file' management system with data base connections. While the term 'data base' is increasingly being used to mean the same as 'file of data', I don't find it a very helpful trend, so I shall stick to the word 'file' when I'm talking about a single file of information which need not be connected with any other data file. 'Data Base' will in these articles continue to be reserved for a system in which the data is stored in one or more files which are interconnected in such a way that the end user (as distinct from the data base administrator) does not need to know which physical file contains the data he needs to access.
dBase II stores data in sequential fixed record length files, and must be given information about the record structure for the file. This information is stored in the first physical record of the file, so there is no need for a separate record definition file, and hence no danger of getting the two out of step (for instance by deleting the record definition file by mistake). dBase II can handle two files of data at once, but not more. Each data file may have one or more indexes for fast access and for updating; these indexes are of equal status, that is, dBase II regards as the primary index which ever index is invoked first on a particular access of the file. If the user wishes it, he can arrange for all indexes to a particular file to be kept up to date automatically when data is being updated, a distinct improvement on other data management packages. Keys used to construct indexes do not have to be unique but the rapid access commands work better if they are.
dBase II has a variety of ways of updating, accessing and displaying the data, making it one of the most flexible packages on the market. It originates in America and is distributed and support-
ed in this country by Encotel Systems Ltd of Croydon, who supplied my review copy.

Constraints
Records stored in dBase II files must all have the same structure and be of fixed length, with the maximum length 1000 characters. No record may contain more than 32 fields, which could be a serious limitation in some applications; a field may contain up to 254 characters. Data items may be numbers, character strings or logical variables (ie, taking the value True or False), no special 'date' type exists, so dates must be stored as numbers in year/month/day order to sort correctly. Arithmetic in dBase II is performed to an accuracy of 10 digits; numeric values may be treated as integers or real numbers, but for length calculations each digit occupies the same space as a character.

Index keys may be constructed from several data fields, but may not be more than 100 characters long altogether. When defining the record structure, data items must be named; these names may be up to 10 characters long. Commands may be invoked from the keyboard, or stored in files and called in with one instruction; command files may include statements invoking other command files, and you may have up to 16 command files open at a time. One or two data files may be in use together. When calculating dBase II allows the user to store, in memory or on file, up to 64 variables for intermediate results; these may be up to 254 characters long, provided the total space used for temporary variables does not exceed 1536 characters.

Data input and editing
Creating a data file is a two part process: the CREATE command allows the user to specify the structure of each record and then to input the data using this structure. Records are display-
ed with a named field on each line, with the type shown and a delimiter used to show how long the field may be. Formatted screens to allow more sophisticated displays can be set up using a set of commands giving full control over the screen format.

Once created, data may be edited using an EDIT command; this involves specifying the record to be edited by a variety of methods and then using a simple screen editing to amend the record displayed. The screen editing uses the same conventions as the popular word processing package Wordstar — CTRL-E for moving up a line, CTRL-D for moving right a character and so on. It would be nice to be able to use the terminal's own cursor keys, but at least the Wordstar convention will already be familiar to many dBase II users. Records may be deleted in EDIT mode but not added; addition is done with INSERT within the data file and APPEND at the end.

Multiple changes are possible too: the REPLACE command lets you, for instance, increase by 10 percent all prices which have not been changed for at least six months, while CHANGE allows you to display each record in a group turn, to allow fields named in the command to be modified without having to specify a record key each time. For all these commands, and all other dBase II commands which can operate over a range of records, the user can specify the range of operation by record numbers, by relative position ('the next five records') or by characteristics of one or more fields — see the section on Selection later.

One useful feature, which makes on-line updating safer to use is that records are not actually deleted when you tell dBase II to delete them — you can 'undelete' them again, provided you have not issued the PACK command, when the records marked for deletion are expunged. Deleted records which have not been expunged can be display-
ed (they are shown marked with an asterisk) but will not be copied, sorted or appended to another file.

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Until a file has data in it, the data structure can be edited without hindrance. Once a file contains data, editing the structure would destroy the data. So dBaseII makes it possible to set up a new, modified data structure and copy data into it. The data may be from another dBaseII file, or from an external file in a variety of formats. This makes it possible to add fields to an existing data file which can have data added later, or to create a data file which is a subset of another, as well as to import data files written by other software. In each case, the operation takes just three or four simple commands, which use the standard dBaseII structure.

It is also possible to use two dBaseII data files in conjunction to modify data. One file may be updated by another, with the user specifying the key to be used to match the files. Or, using a similar technique, two data files can be merged to form a third.

Displaying data

Two kinds of command are used to show data on the screen. The user can either choose which record to show and display it all in one command, or locate the chosen record(s) and then display them. Records may be selected according to location, and display. Using these commands, you can display a set of records matching particular criteria, either as a single line or as a list, or move around in the file using the range specifiers or such position identifiers as Top, Bottom or Skip. You can display a whole record, or just selected fields.

The 'selection only' commands can either use the index currently selected for the file, or use fields for which you haven't created an index, although the latter is, of course, slower. Where several records match a specification, dBaseII displays the first and permits you to 'continue' through the rest one at a time. The command which is normally used for printout, reports can also display data on the screen, so that you can show summaries on the screen too. Some of the commands used to display data from files can also be used to display information from memory, so you can carry out calculations on the current data file and display the results.

Reporting

The REPORT command allows the user to create layout specifications for summaries on either screen or printer. These specifications are stored for subsequent use but cannot be edited. Reports are laid out with fields listed according to column and row headings are allowed but all specification of rows and columns is, as with all the packages I've reviewed so far, in absolute terms - line 3, column 42 etc - so you have to do a lot of counting to make sure the spacing is all right and a lot more each time you change the layout. Records may be selected according to specified criteria and there are some powerful calculating facilities. There is a provision that headings be taken from the field names used in the record definition and the calculation facilities fall short of creating sub-totals when specified fields change. More sophisticated reporting features, such as formatted field display using pictures, are available when fields change, are available through the use of command files (ie, rather than through the REPORT command in its standard form). I wasn't able to make a full test of the report feature, as it didn't work properly on my version of the package.

Selection sets

Nearly all the commands for file access can be modified with a selection parameter. For instance, if you want to select only people over 40, you'd load from a file containing age as a field, and show on the screen the name, age and sex of people in those records on the screen, you can give the command 'DISPLAY FOR AGE > 40' and set up a selection criteria file; you just add a FOR parameter to the display, location, reporting and other commands. Brackets can be used in conditions to ensure the correct order of evaluation and you can use the logical operators AND, OR and NOT as well as the usual comparison operators. Comparisons involving strings may also use an operator which searches within strings as well as comparing complete fields.

Sorting records

In dBaseII, indexing is used to carry out the kinds of operation which in other packages of this type involves indexing and sorting, and I was able to do all my tests without using SORT except as a shorthand. The indexing is very powerful; it is almost as if you have a complete database structure available to you in memory, even if you want to use the STR function. This is specified in the INDEX command, but the specification must include the length of the numeric item, even if you want to use the full length of the field as given in the record definition. So the instruction to carry out the indexing example just suggested could look like this:

INDEX ON STR(AGE,3) + STR(LENGTHED,2) + STR(SALARY,5,2)

When you bring a data file into use, you can specify up to seven indexes to be used with it. Only one will be used to provide the keys for accessing data, but all those specified will automatically be kept up to date, as the data stays in step. This is an unusual and powerful facility, and the integration of updating and indexing makes it much easier to ensure that indexes and data stay in step.

Calculations

The user can perform calculations using data fields, items typed in from the keyboard and constants freely intermixed, using the normal arithmetic operators and brackets to ensure correct ordering. Items can be counted, as well as totalled. Results can be stored in memory variables or in data fields in files, and can be 'one-off' single results or a series resulting from a calculation performed once for every record in the file. Memory variables are referred to by name. Calculations stored in memory can be saved on a separate file for continued use. You can also create a file which consists entirely of aggregates; for instance, if your employees work on several jobs at a time, you can record the job information on a 'session' basis, and then ask dBaseII to create a new file consisting of one record for each job containing the totals of time spent, resources used etc.

Security

This is probably the weakest area in the package. You can of course build protection into command files through which operators invoke dBaseII but the package itself provides no facilities through the ordinary commands to prevent unauthorised access to data. All transactions may be logged, either in the usual fashion on the printer, or on a disk file.

Tailoring

Any command which can be executed from the keyboard may instead be put in a command file for later execution. Other commands, particularly looping instructions, may only be used from...
command files. The instructions look Basic-like at first but have more structure than is common in Basic. For instance, the IF statement must have a matching ENDIF, so you are allowed to nest these pairs. There is a limited form of GOTO, but only to jump to the end of the DO WHILE loop — it's basically 'no GOTO' programming without being obsessive about it, which I personally feel is about the right balance. There are also commands to allow flexible input from and display to the terminal, and fancy layout on the printer; one form of the input commands makes it easy to build menus. I found the command files easy to construct and use, and flexible in their application, though not quite as powerful as those of FMS-80. One helpful feature typical of the consistency found almost everywhere in dBaseII is that throughout, the commands fields are referred to by the names they are given in the record definition.

**Stability and reliability**

dBaseII has been in use for some time in this country and in the States. The previous release reportedly had some bugs in it; the latest release, which I tested, had a couple of glitches that I discovered. I didn't lose any data, or come close to it, but I did have trouble using the REPORT feature, nor could I get the command for editing command files to work properly. Excellet assures me however, that a revised version with the REPORT bugs corrected is on its way from the States and will be forwarded to end users.

**User image**

As distributed, dBaseII is not a menu-driven package, which means that the user must know the form of at least the simplest commands before he can get started. To some extent, it is a matter of taste whether you prefer menu-driven or user-oriented. Personally, I like to have the choice and in dBaseII you only have the option to construct menus — they aren't provided. However, the format of the commands was almost entirely internally consistent, and most operations only required two or three commands. For instance, to find particular records you simply issue one command to tell dBaseII which file to use, and another to specify the keys, and to limit the scope of the search and the display of variables. So I would expect a user with some motivation to find it pretty easy to use. This is largely confirmed by reports from two users, one who had a particular application in mind and became a fluent user in a few days, largely self-taught, and another who got hold of it 'to try it out' and never got very far.

The documentation comes in two parts. The first was written by an experienced user and provides a good, well-paced introduction yet goes right through to the most complex commands. The second part is a reference manual written by the software designer, but is of a much higher standard than usual. I thought the two-level approach a good idea which worked well but it's a pity there is no index for either part, only a list of commands and the pages on which they are described.

There are of course some sillies though I had to work harder to find some than with previous packages I've seen. I don't like the use of the word QUIT to indicate normal ending of a session, especially when the keys CTRL-Q are used to abort in an EDIT command. Even the tutorial manual starts with 'how to install dBaseII for your terminal', including prompts such as 'are you going to use hex or decimal to specify one of the messages when the user is hardly likely to know the difference. I feel that installation information should be in an appendix and no user should try to do it. We're not particularly looking for strings of academic qualifications — experience carries just as much weight.

**Conclusions**

dBaseII is a powerful and flexible data management system, with a well-designed and consistent user interface. Its strengths and weaknesses reflect an approach typical of good software engineers. Among its strengths are the clear command design, which makes it possible to deduce the formats of commands you haven't used before from the familiar ones, which avoids the hierarchy problems of menu systems while remaining easy to use, and which uses the same format for the 'programming' commands so that the user's growth path is smooth and logical. The selection facilities are good and well integrated, the calculation facilities are excellent (even brackets are supported, not to mention real numbers) and the feature which allows you to request automatic updating of all indexes is invaluable. On the other hand, the reporting features are more limited than those of more commercially oriented packages, unless one devises command files to construct more fancy reports. The lack of any protection against unauthorised access to files, in the software as provided, could be a problem in some settings. But if you can cope with the limitation of 32 fields per record, and a maximum of two data files in use at any one time, I think you would find dBaseII a powerful and flexible package on which to build a data management system.
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First IBM, now Hitachi: the mainframe manufacturers are moving into micros fast. Stephen Withers reports from Australia on Hitachi's personal computer, due for release here soon.

As Hitachi chose to call its new micro the 'MB-6890 Personal Computer Basic Master Level 3', it was inevitable that an alternative would be coined by the marketing people - hence it has become known as the Peach. Hitachi has included as standard equipment features which are often classed as extras, especially in lower-priced computers.

**Hardware**

Externally, the only unusual feature of the Peach is the row of five function keys along the top of the keyboard, although closer inspection reveals a number of things that suggest care has been taken in its design. To begin with, the 'Break' key is shielded to prevent accidental depression, and the four rarely used controls (power, volume, mode and reset) lie beneath a flip-up cover, contributing to a clean appearance without sacrificing convenience of operation.

The main keyboard is arranged in the conventional manner, with a secondary pad providing not only numeric keys but also arithmetic operators, cursor control, question mark, return, insert/delete and home/clear screen keys. Of these, only home/clear screen is not duplicated on the main board. The keyboard itself is pleasant to use, the keytops having a matt surface which prevents reflections obscuring the legends. As the review machine had been produced to Japanese specifications, the keys were marked with both Roman and Katakana characters but this would not normally be the case. A type-ahead buffer is provided, making it practically impossible to enter characters faster than the computer can process them, even during disk operations. All keys auto-repeat when held down and the internal speaker gives audible feedback (thankfully, this can be avoided by turning the volume control to its minimum setting).

Katakana characters may also be displayed on the screen, although it would be possible to use an alternative character generator to suit a particular application (I believe a 2732 EPROM is compatible). A number of graphic characters are also provided, including the playing card suits and a handful of Chinese symbols. In an alternative mode, Hiragana characters replace the Katakana and graphic items.

One of the features of the Hiragana script is its smooth curves (so the manual tells me), and to achieve this an interlaced video signal is used giving an 8 x 16 character matrix, instead of the 8 x 8 in non-interlaced mode. This also gives a more solid appearance to other characters. Hitachi warns that the interlaced display can flicker unless a long-persistence monitor (which it offers) is used. Since the colour monitor supplied was of that type, I cannot offer a comparison but I did notice slight instability with white on black text in 80-column mode. A side-effect is that the image takes so long to fade that it can become distracting when scrolling. On the subject of scrolling, this operation is considerably slower when high resolution modes are selected due to the greater amount of information that must be moved around the screen refresh RAM (text and graphics exist on a single plane).

Apart from these minor snags, the monitor gave a very bright and clear display in all modes, and fits neatly on top of the Peach. When using the machine for long periods I found it necessary to turn down the brightness and contrast, although at normal viewing distances (eg, for games, or when in 40-column mode) the display's vividness was a positive feature. A black and white video signal is provided through a phono socket on the back panel and an adaptor to allow the use of a colour TV is an option.

There are two aspects to the display mode: the number of text columns and the graphics resolution. Either 40 or 80 columns may be selected and high or low resolution graphics. The precise resolution depends on the chosen text mode: low resolution is 80x100 (40 column) or 160x100 (80 column), while high resolution is 320x100 or 640x100. Not surprisingly, the more information to be displayed the more RAM is needed for the refresh memory. Fortunately, the display memory is variable - if a mode is selected which requires less than the maximum amount of RAM, the user may choose between releasing the balance for storage of Basic programs and variables, or having several display phases. If the latter option is
taken, the phase actually displayed is selected by a simple Basic statement. I should explain that the colour of each graphic pixel is not independently selectable. What happens is that for each row the pixels falling within a character position all appear in the colour of the one most recently drawn. I find such a restriction greatly reduces the usefulness of a high resolution graphic display but it is regrettably common.

The default display mode is set by a block of switches on the main board. One selects 40 or 80 columns, and another determines the graphics resolution. Other switches are used to select Basic or terminal mode; interlaced or non-interlaced displays; whether Hiragana codes are to be converted to Katakana before printing; between half or full duplex and 7- or 8-bit word length (applies to terminal mode only); and whether or not the bottom row of the screen is to be used to label the function keys. All of these settings may be overridden by various Basic commands. The Mode switch on the front panel is normally used to override the setting of the internal switch determining the number of columns but, by changing the position of a jumper clip, the Mode switch can be used to select between interface/non-interface or Basic/terminal mode. Similar jumpers are used to select Baud rates and handshaking for the built-in RS232 interface.

In addition to the serial port, a Centronics-style printer interface is included as standard equipment along with the cassette and light pen interfaces.

The standard amount of dynamic memory fitted to the Peach is also the maximum amount that can be fitted to the main board. Two additional RAM cards can be plugged into the Peach, each carrying 16k, but, as these overlap the ROMs, only 8k can be used with Basic. The ROM-disabling circuits associated with the memory expansion connectors allow the use of these boards as "language cards" which could be loaded with alternative system software from disk.

A row of six edge connectors runs along the rear of the main board, a la Apple, allowing for such expansion as the disk controller and other I/O devices. Another nice detail is that the back panel adjacent to these connectors is made up of six blanking plates, any of which may be replaced with sockets for connection to external devices.

By now, you are probably wondering what processor is used in the Peach, although the MB-6890 designation does provide a clue. In fact it is a 6809, manufactured under licence by Hitachi. Unless a proprietary operating system is added (such as Flex), this will not impinge on the user as the facilities for working in machine code are minimal.

The disk subsystem supplied for this text consisted of a controller card plugged into the first expansion connector, plus a cabinet containing two single density, single sided 5½in drives and a power supply, plus a very quiet fan to keep the whole thing cool. This makes the package bulkier than normal for minifloppies - I have seen two 8in drives in a case of similar dimensions. There is a 40-second time-out on the drive motors (a positive feature), but head loading and unloading is noisy, and the unusual design of the drive doors makes disk insertion and removal difficult compared to the Shugart pattern.

Each drive has an unexciting 80k capacity, of which 8k are reserved for system use. Quite clearly many potential users will opt for the higher capacity disk systems that are available,
HITACHI PEACH

A selection of Peach plug-ins.

Japanese characters may be removed for UK market.

This is what a Peach looks like after it has exploded!

perhaps waiting for the arrival of the promised hard disk.

Software
As is so often the case, the resident Basic interpreter was written by Microsoft and includes the usual features plus a number of extensions to support the hardware capabilities of the Peach, including a screen editor. When used with a cassette recorder, the interpreter is completely resident in ROM but when disks are added additional features are loaded into RAM, occupying approximately 4400 bytes.

Perhaps the most significant feature of this Basic is that it provides a simple mechanism for handling interrupts generated by the function keys, RS232 interface, or the (optional) light pen. The interrupt handlers themselves are simply written as normal subroutines, and the extended form of the RETURN statement (which allows the programmer to specify the line number from which execution is to continue) makes life even easier. To aid the description, I will outline the statements used with input to the built-in communications port, although those for the light pen and function keys are similar.

Interrupts are enabled with the COM(0) ON statement and disabled with COM(0) OFF. It is even possible to arrange for the interrupt action to be suspended with COM(0) STOP, in which case an incoming character will have no immediate effect but when the next COM(0) ON statement is executed the interrupt will be processed. It is also necessary to establish which subroutine is to be used as the interrupt handler and this is achieved with ON COM(0) GOSUB [linenumber]. Such statements may be used in several places within a program in order to vary the effect of an interrupt according to the context in which it occurs.

The graphics commands are less powerful than those provided in the extended Basic used in the TRS-80 Color...
Computer. Functions are provided to draw and delete points, lines, and rectangles, and PAINT may be used to colour in an outline.

There are some other commands relating to this display that are worth mentioning. Cursor addressing is achievable with LOCATE, which can also alter the appearance of the cursor between solid, blinking, fast blinking, and invisible. The maximum number of characters displayed per line, the graphics resolution and page are all software selectable, although certain combinations are impossible with particular system settings (whether established with the switches mentioned above or the NEW ON command). CONSOLE allows the size and position of the scroll window to be set (or cleared, if only the scroll bar is to be displayed, as well as enabling or disabling the display on the bottom line of the strings assigned to the function keys. A nice touch is that this display changes to show the effective functions when the shift key is pressed.

Any string of 15 or fewer characters may be assigned to each function key, and then whenever the key is pressed the effect is as if that string had been typed in manually. In order to enter direct commands with one keystroke, a carriage return is added to the command before assigning it to the function key (eg, KEY 1, "LIST") + CHR$ (13)). The system powers up with a reasonable set of pre-set assignments when programs are loaded, but when programming I preferred to specify my own, including the common Basic keywords like FOR, NEXT, and GOSUB. This use of the function keys is quite separate from that involving interrupts.

The interpreter allows the assignment of files to all devices (except the light pen). Names have been allocated to each device and provision has been made for future expansion — for example KYBD: the keyboard, COMO: the built-in RS232 interface, and LPT2: the third (and currently non-existent) printer interface. Disk drives are 0: to 3: 0: being the default device for Disk Basic.

The significance of this is that when sequential files are used input and output can be easily switched between devices by changing the device parameter of the OPEN statement. A possible use during program debugging is to assign what would normally be a disk file to the keyboard and screen, allowing easy viewing of the intermediate stages of program development.

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### Documentation

Oh dear... you remember those instruction leaflets that used to come with goods manufactured in the Far East ('depress the button most fully' and that kind of thing)? Well, that's what came with the Peach. In fact some of the manuals supplied with the review system were actually printed in Japanese as it was one of the first five units brought into the country.

To be fair, some explanation should be made. Apparently, what happened was that Microsoft (naturally) wrote the Basic manuals in American-English and these were then translated into Japanese. Unfortunately, Hitachi mislaid the originals and had to re-translate back into English. This led to such gems as: 'Color codes of 8 and over correspond to 0 through 7, and they are in the contrast of the character colour and background color.' What this actually means is that there is a simple way of obtaining the equivalent of inverse video, without having to specify both background and foreground colours.

<table>
<thead>
<tr>
<th>Memory map</th>
<th>Interrupt vectors</th>
<th>I/O addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>FF6FH</td>
<td>FF80H</td>
</tr>
<tr>
<td>Basic and monitor</td>
<td></td>
<td>A000H</td>
</tr>
<tr>
<td>Expansion area</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disk Basic</td>
<td></td>
<td>TFFFH</td>
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<tr>
<td>Basic program and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>variables</td>
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<tr>
<td>Display</td>
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<tr>
<td></td>
<td>0400H</td>
<td>0000H</td>
</tr>
</tbody>
</table>

Twin disk drive unit.

**PCW 107**

is OS-9. This is a Unix-like system, with multi-tasking and multi-user capabilities. Languages available include Pascal, COBOL and FORTRAN, as well as an assembler and debugger. I was only able to examine the manuals, but OS-9 appears to be a very powerful system.
HITACHI PEACH

One improvement that would be very easy to make is the provision of an index, or better still, the rearrangement of the descriptions of Basic keywords into alphabetical order. The existing scheme gathers together instructions with related functions (eg, graphic commands, printer control instructions), which makes reference to the manual particularly time-consuming.

Now the good news. The reason that Hitachi launched the Peach in Australia before it did so in Britain or the US was to ensure that any problem like dodgy manuals or hardware glitches were thoroughly ironed out. Since my criticisms are aimed at the phrasing of the manuals, rather than their content, all should be well by the time you see the machine in Europe.

As the present manuals are so difficult to read (and the number of typographical errors adds to the problem), it is hard to criticise them from any other angle. I think most of the necessary information is in there, it just needs ferreting out and deciphering.

Hardware details are contained in the service manual, which includes a full set of circuit diagrams and fault-finding flowcharts, as well as a description of the function of each subsystem. Unfortunately this appears to have been translated by the same person as the Basic manuals – enough said?

Expansion

The design of the Peach allows for a considerable degree of expansion. As already explained, one or two 16K RAM cards can be plugged into the main board, although going beyond a total of 40k of RAM in this way means disabling the Basic ROMs. If the OS-9 operating system is employed, it is possible to utilise Australian-made bank-switching cards giving a maximum memory size of one megabyte, although these plug into the ‘peripheral’ slots, rather than the memory expansion connectors.

A selection of disk controllers are available. Both 5¼in and 8in drives are catered for, with double sided/double density versions from non-Hitachi sources. Hard disk and streaming tape units are promised for the near future.

If the comparatively small range of Peach software is considered inadequate, it is possible to fit a Z80 processor card in order to run CP/M software.

Prices

(Australian dollars, excluding sales tax)

<table>
<thead>
<tr>
<th>Component</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peach</td>
<td>1495</td>
</tr>
<tr>
<td>RGB Monitor</td>
<td>1149</td>
</tr>
<tr>
<td>Disk controller</td>
<td>175</td>
</tr>
<tr>
<td>Twin s/s/s/d 5¼in disk drives</td>
<td>1495</td>
</tr>
<tr>
<td>16k RAM Card</td>
<td>129</td>
</tr>
</tbody>
</table>

For comparison, a 32k Apple with RS232 and Centronics interfaces, clock, numeric keypad and other accessories to equal the specification of the Peach would cost around $A3000. $A1 = $5p (on 5/3/82).

Conclusions

The Peach is basically a very nice machine, with system software to match. There are a few areas which could be improved (more graphics commands would be useful) but compromises are always necessary. It is being aggressively marketed in Australia with a relatively low price, but this might not be the case in the UK.

Hitachi seems to feel it is the ideal microcomputer for all purposes but I am sure we have all heard that line before. For business and commercial use, appropriate software is the key and at this stage it is not available in any quantity for this machine. The larger capacity disks are likely to be needed for such applications. Educational users may find the graphics an attractive feature, and the reasonably ‘standard’ Basic is another plus point. The additional costs involved in running other languages could be offsetting to scientific and technical users, especially when the result is unlikely to support the graphic and other features of the computer. This leaves the home/hobbyist market, and I have yet to find a computer in this price range being used for bona fide domestic applications (maybe I don’t move in sufficiently affluent circles) – perhaps in the USA things are different. It would be a nice machine to own but, as before, there is a dearth of software.

If Hitachi’s plans come to fruition, most of my criticisms will not apply when the Peach appears in Europe. Once the documentation is improved and the software gap filled, the Peach should attract many potential buyers. As for the future, it is worth remembering that Hitachi is likely to be the first manufacturer to produce 256k RAMs in quantity: if its agreement with Motorola also covers the 68000, who knows what the next year or two will bring?

---

**Basic Benchmarks**

<table>
<thead>
<tr>
<th>BM</th>
<th>Time</th>
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<tbody>
<tr>
<td>1</td>
<td>2.0</td>
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<tr>
<td>2</td>
<td>11.0</td>
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<tr>
<td>3</td>
<td>26.0</td>
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<td>4</td>
<td>26.0</td>
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<td>5</td>
<td>27.0</td>
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<tr>
<td>6</td>
<td>46.0</td>
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<tr>
<td>7</td>
<td>78.0</td>
</tr>
<tr>
<td>8</td>
<td>10.0</td>
</tr>
</tbody>
</table>

**Disk Benchmarks**

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.0</td>
<td>7.0</td>
<td>18.0</td>
<td>9.0</td>
<td>17.0</td>
</tr>
</tbody>
</table>

All timings in seconds. For an explanation and listing of the Benchmark programs, see PCW Vol 4 No 11, November 1981.

**Technical specifications**

- **CPU:** HD6809P
- **RAM:** 32K dynamic
- **ROM:** 24k
- **Disks:** Optional, maximum 4 drives, 80k per drive (single sided, single density).
- **Cassette:** 600 baud (cassette recorder optional)
- **Serial Port:** RS232, bidirectional
- **Parallel Port:** Centronics style.
- **Screen:** 26 rows of 40 or 80 characters. Graphics resolution up to 640x200. Light pen interface included (light pen optional).
- **Keyboard:** 87 key
- **Languages:** Level 3 Basic (others available)

---

'But think about it Dad! With one of these we could have millions of commandments!'
Many of us spend years at school learning how to solve algebraic and trigonometric equations in all their simple, simultaneous and quadratic varieties. The examples from the text books always seem to have the most beautifully simple integer solutions. Yet, when we enter the hard world to earn a living, the equations we are called upon to solve, those of us, that is, who chose to follow engineering and similar professions, are invariably monstrosities. By monstrosities I mean something like, for example:

\[ \sin(3x - 2x^2 + x^2 - 15) - 4x + (x^2 + 3)^{1/2} + 5 = 0 \]

An example, by the way that is pure invention.

Such expressions can be tackled by methods of trial and error, or successive approximations, which tend to be very tedious exercises, particularly if a high degree of accuracy is required. Another method is to plot the graph of the function \( y = f(x) \), where \( f(x) \) is obtained by manipulating the original equation so that everything lies on one side of the equals sign, thus:

\[ \sin(3x - 2x^2 + x^2 - 15) - 4x + (x^2 + 3)^{1/2} + 5 = 0 \]

By calculating \( y \) for various values of \( x \) and plotting the graph of \( y \) against \( x \) we can find the value, or values, of \( x \) for which \( y = 0 \). Such values are the required solutions. They are the values of \( x \) where the graph line crosses the \( x \) axis.

When it comes to tedium, this medium lacks nothing, and the accuracy leaves much to be desired. Fortunately, it is a simple matter to program a computer to calculate \( y \) values by the score ready for plotting. About three program lines would be needed. It seems an obvious next step to let the computer plot the graph and determine where the line crosses the \( x \) axis. However, this is not as simple as it appears. Microsoft Basic, which has been used for the program at the end of this article, has a POINT function, which will 'look' at any graphic block on the screen and return a signal if that block has been 'lit'. By looking in turn at each block along the \( x \) axis one could soon determine the value, if any, at which the graph touched it. One would have to refrain from plotting the \( x \) axis itself, of course, otherwise all the blocks would be lit.

There are several reasons why this will not work. The Video-Genie, for which the program was written, has 128 graphic blocks across the screen. Many micros have less. Therefore, the value of \( x \) where the graph touches the \( x \) axis can be no more accurate than 1/128 of the distance or difference between the smallest and the largest plotted values of \( x \). If the answer is required to an accuracy of (say) four places of decimals and it is known only that it lies between (say) 0 and 100, one would have to use a program something like this:

```basic
10 P=Q: Q=0.0127
20 FOR X = P TO Q STEP 0.0001
30 Y = F(X)
40 IF Y = 0 THEN PRINT X
50 NEXT X
```

The missing lines would include the instructions for clearing the screen, plotting the graph, and the POINT function, etc. But why does the latter function? Why does it return the value of \( y \) such as if \( Y=0 \) PRINT \( X \), \( X \) being the required answer? The reason is that computers have a limited accuracy. When the value of \( y \) approaches zero, the computer will round the calculated value to fit in with the chosen scale. If \( y \) approaches zero gradually, many values could be rounded to zero and plotted along the \( x \) axis, producing false answers.

All of these difficulties can be overcome, and doubtless have been, by using a sufficiently complex program to produce answers automatically. However, the program which follows is relatively short and simple and is capable of solving equations to any degree of accuracy within the capabilities of the particular computer used. It does require attention from the operator.

## The program

It is assumed that the operator, knowing the source of the equation, will be able to estimate the lowest and highest values of \( x \) within which the solution lies. This is not essential but it shortens the procedure. These values should be entered in lines 10 and 20, during the RUN. Before RUNning, however, line 110 must be edited and \( f(x) \) replaced with the function to be solved.

Lines 30 and 40 draw the \( x \) axis on the screen. As mentioned above, the Video-Genie display is 128 blocks wide; hence \( N = 0 \) to 127. The display is 48 blocks from top to bottom and the origin of the plot is in the top left hand corner, ie, \( x \) values are plotted from left to right and \( y \) values from top to bottom. A line across the centre of the screen, the \( x \) axis, occurs therefore at \( y = -23 \).

Lines 50 and 60 divide the \( x \) axis into four equal segments, putting five 'pips' under the line. Lines 65 to 90 assign values to the pips. The lowest value chosen for \( x \) is printed under the left hand pip. The values under the remaining pips increase equally, until the highest value of \( x \) is printed under the right hand pip. The values are printed at the bottom of the screen, rather than immediately under the axis, to avoid obliteration by the graph points. The semi-colon in line 90 prevents scrolling each time a number is printed.

The \( x \) axis is divided into only four segments so that the five numbers do not overlap. The Video-Genie display is 64 characters wide so that five twelve-digit numbers, including the sign, can be printed with a space between. The number of segments could be increased by printing the numbers alternately on two lines, allowing them to overlap. In practice, the four segments seem to be adequate.

Lines 95 to 140 calculate the \( y \) values and plot the points. Line 95 sets the interval between the \( x \) values, the smallest interval possible with the Video-Genie being 1/128 of the span. Plotting 128 points is time-consuming. Increasing the space between points reduces the time but increases the chance that the \( y \) value may cross the \( x \) axis and return without being registered. The interval must of course relate to the divisions on the \( x \) axis. An interval of 1/26 of the span has been chosen as a suitable compromise.

If the value of \( y \) lies outside the range of \(-23 \) to 23, the graph point will lie outside the display and the RUN will end on an error. Line 120 checks the \( y \) value and repeatedly divides by 20 until the value is acceptable.

As described above, when the value of \( y \) approaches zero the points tend to be plotted along the \( x \) axis itself, making it impossible to detect the correct answer. Line 125 detects
Instead of \( N \) all the 27 points would be plotted in the left hand quarter of the screen. Using \( N \), and increasing it by four each time, spreads the points so that they occupy the correct positions relative to the scale. The plot has to use 23-Y instead of \( Y \) in order to shift zero \( y \) from the top left corner of the display down to the \( x \) axis.

Lines 150 to 170 hold the display until the operator is ready to continue, which he does by pressing any key and entering new values on either side of the point where the graph crosses the \( x \) axis. The graph remains on display while he is doing this. The process is continued until a sufficiently accurate value of \( x \) can be read off. If the process is carried on long enough, the interval between \( XL \) and \( XH \) becomes so small that the computer cannot divide it (without going into double precision arithmetic) and identical figures will appear at two or more points along the axis. This does not affect the result.

Pushing the computer to the limits of its accuracy can produce other strange effects. When the difference \( D \) in line 65 becomes very small, the increment \( S \) in line 100 becomes virtually zero, or is rounded down to zero, so that the loop becomes endless. The plot would go off the screen and the computer would stop on an error. To avoid this, \( N \) is tested in line 140 and the program exits from the loop if \( N \) exceeds 127.

In entering the lowest and highest values, \( XL \) and \( XH \), it should be realised that the computer will calculate and plot \( Y \) for 25 values of \( X \) between these limits. If \( XL \) is negative and \( XH \) positive, it is possible that one of the 25 values could be exactly zero. It is vital therefore to inspect the equation for elements which could result in division by zero, or become infinite, such as cotangent \( x \). Where such elements are obvious it is better to enter the positive and negative values as separate exercises, avoiding zero, e.g., rather than enter \( XL = -10 \), \( XH = 15 \), enter \( XL = -10 \), \( XH = 0 \). Even where there are no obvious divisions by zero, this fault can still occur. A trivial example would be \( 1/(x-1) \) which would trip out at \( x = 1 \). Also, similar difficulties can be encountered in the ROM programs for calculating trigonometric functions or logs, etc. In these cases the difficulty can usually be overcome quite simply by making slight alterations to the values of \( XL \) or \( XH \) or both. If this does not work, the interval between \( XL \) and \( XH \) will have to be subdivided in separate entries made.

Further difficulties can be encountered with negative numbers when the expression contains fractional powers, roots and logs, etc. Nevertheless, it is usually possible to obtain at least one solution, any missing solutions being complex numbers which cannot in any case be evaluated by this graphical method.

The Video-Genie will provide answers to six significant figures without recourse to its double precision arithmetic facility, as is illustrated by the following two examples.

### A monstrous solution

Before solving the monstrosity inverted in the first paragraph, let us try a more homely example:

\[
6x^4 - 4x^3 + 3x^2 - 8x - 10 = 0
\]

Because the highest power of \( x \) is five, there will be five solutions. Complex roots always occur in pairs so that there must be at least one real answer. The possibilities are one real and four complex, three real and two complex, or all real. Two or more real roots may be equal. In practical applications, the operator will have some idea of the range of values within which the solution will lie. This is not so with this theoretical example, so we try (say) \(-100\) and \(+100\) for \( XL \) and \( XH \) respectively.

The screen shows that the plot crosses the \( x \) axis at a point just higher than zero. We therefore re-enter \( XL \) and \( XH \) with values \( 0 \) and \( 10 \) and see that the crossing point lies between 0 and 2, which values we enter next. The narrowing down process continues fairly rapidly with the following pairs of values (this is an actual example) \((1.25, 1.4)\), \((1.37, 1.38)\), \((1.377, 1.3775)\), \((1.37705, 1.37708)\), and we read the answer \(1.37707\).

To solve the original equation we edit Line 110 to read

\[
Y = \sin((x^5 - 2x^3 + x^2 - 1.5) - 4x^2 + x^2 + 5).
\]

(Note that \( XA5 \) means \( X \) raised to the fifth power.) Again, we have no idea where the solution lies, so we try \(-100\) and \(100\) and note that the plot crosses the axis twice, at a little less than zero and a little more than zero. In order to get a little closer we enter \(-10 \) to \(10 \) followed by \(-2.5 \) to \(2.5 \). At this point we can see that the crossing points are about \(-1.25 \) and \(+1.25 \). Dealing with the negative value first we enter

\[
(-1.2, -1.2), (-1.28, -1.275), (-1.281, -1.28), (-1.2805, -1.28045), (-1.28045, -1.28044)
\]

and find the first solution \(-1.28045\).

To find the positive solution we enter \(1.2\) to \(1.3\) and find with this increased magnification that there are in fact two crossing points at approximately \(1.25\) and \(1.29\). Continuing as above, we enter another four pairs of numbers, finishing with \(1.24708\) and \(1.24712\). We read the second solution as \(1.247115\), where the final 5 is estimated from the scale.

A further four pairs of numbers ending with \(1.29437\) and \(1.29439\) give the third solution as \(1.29438\).

If on entering the original values of \(-100\) and \(100\) the plot did not cross the \( x \) axis, there are the following three possibilities. The range of values covered was not sufficiently extensive. The range was too great, allowing the \( Y \) value to cross and re-cross the \( x \) axis between the plotted points. All the solutions are complex. A small amount of trial and error is indicated.

```plaintext
10 INPUT "LOWEST VALUE OF X"; XL
20 INPUT "HIGHEST VALUE OF X"; XH
30 CLS: FOR N = 0 TO 127
40 SET (N,23): NEXT
50 FOR N = 1 TO 105 STEP 26
60 SET(N,24): NEXT
65 D = XH-XL
70 FOR N = 0 TO 4
80 X(N) = XL+N*D/4
90 PRINT @ 960+13*N, X(N);: NEXT
95 S = D/26: N = 1
100 FOR X = XL TO XH STEP S
110 Y = f(X)
120 IF Y >23 OR Y<-24 Y = Y/20: GOTO 120
125 IF Y < 1 AND Y > -1 Y = 20*Y: GOTO 125
130 SET(N,25-Y)
140 N = N+4: IF N < 128 THEN NEXT
150 PRINT @ 0, "PRESS ANY KEY TO CONTINUE"
160 A$ = INKEY$: IF A$ = "": GOTO 160
170 GOTO 10
```

The program requires about 0.5K of memory.

110 PCW
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Apple II was a very hard act to follow. It may not be the biggest-selling micro (the ZX81 has pipped that title), but it's certainly the best-known and possibly the best-loved micro so far. It has put its inventors at the head of a multi-million dollar company and made the US stock market take microcomputing very seriously indeed. In fact, the US micro industry is growing more and more to rival the music business for the rapidity with which fortunes are made from smash hit product; surely it will not be long before InfoWorld (our industry's Billboard) begins to publish a software Hot 100.

Apple's problem, then, was the perennial one of following up a hit single. With so much to live up to, it was almost inevitable that the critics would express disappointment at anything which fell short of the miraculous, and when a premature launch in 1980 revealed a crop of hardware problems the word went out that Apple III is a loser. Having finally got my hands on the relaunched model, I can appreciate the industry's difficulty in enthusing over Apple III but I can't agree with the assessment. The machine's virtues are of a subtle rather than revolutionary kind; the hardware is recognisably a gradual development from Apple II rather than a leap into the 16-bit maelstrom, but the operating environment is a considerable advance on current personal computer standards. It appears to have been influenced more by the latest trends in computer science than by the commercial and business sectors and, like its illustrious predecessor, it has the potential to fill a broad range of applications rather than being a single-purpose machine.

Hardware
The Apple III is based around a single 6502B processor (2 MHz), with Apple-designed support circuitry to allow extended memory addressing. The standard machine comes with 128k of RAM which can be expanded on the main board to 256k without using up any of the expansion slots. Only 4k of ROM are present, containing a bootstrap loader and diagnostic routines, as the system is entirely disk-based.

To a casual glance the computer may look like an integrated unit; in fact, the monitor is separate but cleverly styled into a unified line. The computer unit is a little larger than Apple II, and includes a single 5in disk drive and a non-detachable keyboard. A truly massive alloy casting provides the main frame for this unit, with only a top cover and keyboard fascia being fabricated in regulation Apple beige plastic. This mass of metal is not merely to provide structural rigidity - its main function is to act as a heat sink, since no fan is fitted, and its secondary purpose is to shield RF emissions. The rear face has heavy finning cast into it; after half an hour of use the whole body becomes lukewarm but it never exceeds this temperature, even when left on overnight.

The rear of the case also displays seven assorted I/O ports; a disk drive interface, two joystick ports (A and B), an RS232 port, and outputs for monochrome and colour video and audio to an external amplifier. Joystick port A also doubles as an output to the Silentype printer. The RS232 port has programmable baud rate and handshake protocols.

Access to the internals is easy since the top case removes via two 1/4-turn aircraft-type fasteners but, once inside, little is revealed as the electronics are buried at the bottom of a very full enclosure. The main board fills the whole case bottom and the RAM inhabits a piggy-back board under the keyboard section. By virtue of using 64k RAMs, all the 256k of expansion memory can fit on the piggy-back board; access for maintenance is, in fact, performed from underneath the case and Apple issues a strong warning that this is out of bounds to users. The only free space inside the case is devoted to the four Apple II-style 50-pin expansion slots provided for peripheral cards, including the Profile hard disk controller.

The on-board disk drive is a 5in 143k single sided, double density unit like the Apple II units, and up to three external drives may be daisy-chained via the interface socket. The 5Mb Profile hard disk does not use this socket and four of these could be supported in addition, the only strain being imposed upon your bank account.

Monitor III is a 12in green screen monochrome monitor with a maximum resolution of 560x192 and the ability to display a 16-step grey scale (see photograph) which allows the colour graphics facilities to be used. The unit I tested was made by Hitachi, though the Apple literature refers to it as the Sanyo monitor; presumably Sanyo makes them too. It sits neatly on top of the computer case though it has its own
power cable and on-off switch and connects to the video socket via a coax cable. The display is sharp, steady and legible in most lighting conditions, thanks to a non-glare filter on the screen and a contrast control on the front panel. To obtain a colour display you have to supply your own colour monitor.

The keyboard has 74 keys, 13 on a separate numeric pad, and is a considerable improvement over the Apple II in having four cursor control keys and the reset safely tucked away in a recess in the top edge of the unit. The keys are nicely shaped and have a positive feel, but are not as tactually influenced by UCSD Pascal and by Unix; the keyboard and the VDU and ‘block’ devices which are floppy or hard disk units. Block devices have a volume name as well as a device name; for example, the built-in floppy drive is device 'D1' but the volume name attaches to the disk in the drive, eg, ACCOUNTS. When specifying the pathname of a file, either the device or the volume name may begin it. Unlike CP/M, SOS automatically logs the volume name of a disk in a drive and so it will search all the drives present for a named volume; it can also prompt you to put a named volume into a certain drive. If you move a volume to another drive, SOS still finds it, which removes the source of a lot of annoying BDOS ERRORS and reboots under CP/M. While on this subject, SOS has over 60 error messages which are in comprehensible English; for example, 'Invalid Pathname' or 'Interpreter File not found' or 'Disk drive not present/not configured'. More important still, SOS invariably fails gracefully when these errors are encountered and allows you to try again in a correct manner without a reboot. The boot ROM performs RAM, ROM and various other hardware tests on power-up and can display certain diagnostic messages in the event of failure.

SOS is composed of three modules, all of which must be present on a bootable disk. The system is always booted from 'D1', the built-in drive. SOS.KERNEL contains the nuts and bolts interface to the computer, including the management of the paged memory. SOS.INTERP contains a Pascal p-code interpreter (most of the system software is in compiled Pascal)

The legacy of UCSD is that all devices attached to the Apple III are treated as files. SOS recognises 'character' devices such as printers, the keyboard and the VDU and 'block' devices which are floppy or hard disk units. Block devices have a volume name as well as a device name; for example, the built-in floppy drive is device 'D1' but the volume name attaches to the disk in the drive, eg, ACCOUNTS. When specifying the pathname of a file, either the device or the volume name may begin it. Unlike CP/M, SOS automatically logs the volume name of a disk in a drive and so it will search all the drives present for a named volume; it can also prompt you to put a named volume into a certain drive. If you move a volume to another drive, SOS still finds it, which removes the source of a lot of annoying BDOS ERRORS and reboots under CP/M. While on this subject, SOS has over 60 error messages which are in comprehensible English; for example, 'Invalid Pathname' or 'Interpreter File not found' or 'Disk drive not present/not configured'. More important still, SOS invariably fails gracefully when these errors are encountered and allows you to try again in a correct manner without a reboot. The boot ROM performs RAM, ROM and various other hardware tests on power-up and can display certain diagnostic messages in the event of failure.

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There is nothing comparable ....... at any price
plus the appropriate language inter-
preter (eg, Basic), while SOS.DRIVER
controls the implementation of device
programs to drive peripheral devices.
This latter module can be configured to
the user's needs by one of the utility
programs and is roughly equivalent to
CP/M. SOS.DRIVER sets up a range
of device drivers which are .CONSOLE,
which is always
required, .PRINTER or .SILENTYPE,
drivers are .CONSOLE, which is always
floppy disk drivers are built into SOS.

The top part of the screen contains
the main menu and the utilities panel,
which in turn lead to further
screen changes.

To choose an option, either type in a
certain number of disks being handled.
For

computers, .RS232 and .AUDIO for the

The principal disadvantages I found
include UNKNWN!) and

The four

modules

are

supported.

The various letters and symbols in
the IMAGE line specify left or right,
justification, centering, number of
characters in a field, spaces, carriage
returns, leading zeros, asterisk fill, and
even the insertion of literals into the
formatted output. For purely numeric
output, fixed point, scientific and
engineering formats can be specified as
well.

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engineering formats can be specified as
well.
APPLE III

they are in p-code, although the manuals imply that they are in Assembler.

Pascal

I really should have discussed the Pascal before the Basic; only tradition prevented me. In many ways, Apple III is a Pascal machine in that the operating system uses many Pascal-like features and is partly written in Pascal, and even the Basic has many features imported from Pascal. In particular, the system of Invokable Modules means that many facilities such as the graphics are shared by both languages.

The version of Pascal adopted is UCSD Pascal 2.1 and, not presuming to be an expert in the system, I can do little more than describe its non-standard features. This was, in fact, my first encounter with UCSD and I was surprised to find the environment much less severe than I had feared; not much harder in fact than an interpreted language. The system has three main levels, the command level, the editor and the filer. At each level the top line of the screen displays a menu of available commands, only the first letter of which need be typed. From command menu you get into the editor, which is very easy to use. It is a screen-oriented affair with insert and delete and the capability to copy large chunks of text via a buffer which holds deleted text. It also assists with the indenting of program text by remembering the margin spacing. Once your source program is ready it is stored in your workfile, you return to command level and hit C for compile, whereupon your program is compiled to p-code. When you run the p-code file it is interpreted into 6502 machine code. The Compiler feeds you with information on the size of the compiled code and any errors encountered. The filer offers the same file management facilities as the SOS Filer, which is in fact just a tarted-up version of it. Also included in the system is a macro assembler and a library of pre-compiled units which can be linked into or called from programs. The system is supplied on three disks, but creating a work disk with a sensible amount of space requires juggling the components around and creating a two-stage boot system with SOS on a separate disk.

Apple III Pascal has some extensions to UCSD 2.1; in particular the floating point maths is upgraded to meet the IEEE standard. Unfortunately, I was unable to run the PCW Benchmark 'maths' because the SIN and EXP functions are not in the main language but in library units called REALMODES and TRANSCEND. After adding a USES statement to link these modules, the compiler kept insisting that they were not in the library and, as performing a library map showed no sign of them, I gave up.

Other additions to the standard include the datatypes Wordstream and Bytestream, which effectively allow the creation of arrays whose size is defined at runtime. Treesearch, which performs a fast search for an eight-character name at runtime, Treesearch, which performs a fast search for an eight-character name in an alphabetically ordered binary tree and a group of byte-level routines to fill, move and search blocks of memory. Also added is an 'Otherwise' clause for the Case statement.

Graphics

The simplest of Apple III's graphic modes is the text mode, which is the normal operating mode. Even in this mode there are a number of options. Four different character sets are stored on disk and can be loaded by the module DOWNLOAD.INV. Two of the fonts, APPLE (the style used for the company logo) and BYTE are so fancy that they render text virtually unreadable, but ROMAN, which has square serifs, is rather pleasant.

Three different text modes are available, namely 0, which is 40 character/line, black and white; 1, which is 40 char colour; and 2, which is 80 char black and white and is normally set on by system calls. A calling area smaller than the screen can be set, cleared or reset either from Basic or by sending an ESC code to the console driver.

The high resolution graphics are obtained through the invokable module BGRAP.INV. PGRAP Unit in Pascal, which contains a variety of routines to draw lines, set colours, fill areas and define shapes. To use the graphics the driver must be first opened with OPEN#1, BGRAP, then BGRAP.INV is INVOked and then the various instructions can be PERFORMed.

Four graphics modes are available: 280x192 in restricted colour or monochrome; 560x192 in black and white only; and 140x192 in 16 colours. On the Monitor III the colour modes show in shades of grey. Early implementations allowed two buffers so that two separate screens can be drawn and displayed alternately, allowing animation effects. The graphics routines work fast enough to produce reasonable effects, as witnessed by the galloping horses in the demo package. GRAFIXMODE selects a mode and buffer to display, while GRAFIXON switches buffers and clears one. TEXT returns to text mode. Text can be freely mixed with graphics, using either the current system character set or a user-defined one.

Two sorts of plotting command are available, those which use absolute screen coordinates (DOTAT, LINET, MOVETO) and those which plot relative to the last point plotted (DOTREL, LINEREL, MOVEREL). The latter would make implementation of Turtle graphics a lot easier.

A very sophisticated system exists for colour control. As well as defining the background colour and 'pencolour' (ie, the colour plotted), it is possible to define relationships between colours which overlay one another. The command SETCTAB (%11,%8,%9) means "wherever pink is placed over brown make the result show as orange", which is invaluable for drawing maps or circuit layouts, as well as being a lot of fun. Also, by using the so-called 'transformations', the ability of Boolean operations can be performed between back and foreground colours, eg [NOT foreground] XOR background. If you can fathom them, these allow figures to be transparent, blurred or opaque and give many other effects.

The shape-defining routine is surprisingly crude by comparison; it sets up a bit map of the shape represented in a (decimal) integer array and allows it to be placed anywhere on the screen (but not scaled or rotated). It is a real pig to use as the principal command, DRAWIMAGE, takes six parameters, one of them an array address. A related routine NEWFONT is used to define character sets; I wish you the best of luck but I'll stick to Sirius's EDOT, thank you.

Finally, GLOAD and CSAVE allow you to preserve screen images as disk files (type .FOTO) and reshow them later.

Apple II emulation

Apple III can be persuaded to think it's an Apple II to run the vast number of programs which have been produced over the years for the 8-bit machine.

On booting the emulation disk, a menu is displayed which allows certain...
limited configuration options to be chosen. The default is a 48k Apple II Plus with 16-sector disk, Applesoft Basic and a serial card, but you could choose Integer Basic and set various printer parameters to suit the program you wish to run.

There are some limitations to the emulation rules programs which require support from a language card can be run and h-i-res colour graphics cannot be displayed on an RGB monitor. Pascal programs written for Apple II can be recompiled on the III as it can read the source disks. Another problem is that the keyboards produce some different codes; a table in the manual shows where unexpected results may occur.

This feature should be very attractive to Apple II owners who wish to upgrade and already have an extensive software library, and it makes a lot of commercial sense in the US where an ocean of Apple II software exists.

**Documentation**

To call this documentation comprehensive would be an understatement. I had no fewer than eight manuals: Owner's Guide, Standard Device Drivers Manual, Business Basic vols I & II, Pascal Introduction Filer and Editor, Pascal Programmer's Manual vols I & II, and Pascal Program Preparation Tools. All are well-written in a friendly but authoritative style and are nicely produced in spiral binders. Just about everything you want to know is in this manual. The only exception I know of is that the Basic invocable modules apart from BGRASF are not covered. However, it is often the case with the Apple II manuals that you don't know which volume to look in...

As to the question of who will use Apple III, it should appeal to scientists and engineers for its powerful graphics and the tremendous maths capability of UCSD Pascal. The IEEE floating point includes Affine and Projective modes which can handle arithmetical infinities, as well as improved precision and error checking. A Universal Parallel card is available for instrument interfacing. However, I can't say this is IEEE - 486 compatible.

**Explanation and potential use**

The system as tested could have been expanded to 256k RAM, a Profile 5Mb hard disk (and two more outboard floppies) and a Qume daisywheel printer could be substituted for the Silentype for letter-quality work.

A package called Access III allows communication between Apples via the RS232 or use as an intelligent terminal for timesharing and remote database applications.

Word processing is catered for by a completely revamped version of Applewriter which is far superior to the original (chorus of 'it would have to be'). As well as supporting an 80-column screen and upper and lower case, it has several of the best features of the Pascal editor, including the delete buffer, which allows you to change your mind if you make an incorrect deletion and also to move small chunks of text without the bother of block markers. A Mail List Manager package makes this into a competitive WP system at last.

**Technical specifications**

- **Processor:** 6502B (2MHz)
- **Memory:** 128k RAM, 4k ROM
- **Disks:** Two 140k 5¼ single sided, double density
- **Display:** 124 monochrome monitor, 560x192 max graphics resolution, 80 or 40 column text. Comp video & RGB outputs
- **Keyboard:** 74-key ASCII with separate numeric keypad
- **Audio:** 2in speaker with 6-bit DAC
- **I/O:** RS232, twin joystick, Silenteype printer
- **System software:** Apple SOS
- **Languages:** Basic, UCSD Pascal, Assembler

**Visiocale III** is an enhanced version of the famous package, with more extensive editing and conditional branch abilities; it can be used in conjunction with a business graphics package which produces bar and pie charts and performs curve fitting and other plots using Visiocale files if desired.

**Other languages promised soon are** C/Cobol, Transforth and the ALD Assembler, while Fortran must follow fairly soon.

**As to the question of who will use Apple III,** it should appeal to scientists and engineers for its powerful graphics and the tremendous maths capability of UCSD Pascal. The IEEE floating point includes Affine and Projective modes which can handle arithmetical infinities, as well as improved precision and error checking. A Universal Parallel card is available for instrument interfacing. Although I can't say whether this is IEEE - 486 compatible.

**Expansion**

**Forward-looking programmers ought to love it as the SOS/Pascal environment is well suited to work in.** This bodes well for a future supply of high quality software once the initial bad press has worn off and sales pick up.

**In business,** the III would make an excellent management tool for planning and forecasting, the same role which the Hewlett-Packard 125 is aimed at; the hard disk and communications would be a bonus here. It's not as certain how useful it will be to the small business, as it offers very little advantage over a CP/M machine. The pool of ready-made business software is not so large, the floppy disk capacity is small and the hard disk is expensive. Also, although I find SOS superior to CP/M, it is every bit as frightening to the inexperienced end-user — if rather more forgiving.

**Apple III would make a very rewarding machine for experienced hobbyists** but I fear that, at least in the impoverished UK, it is just too expensive.

**Prices**

- Apple III with Monitor III, SOS, Business Basic, Apple II
  - Emulation and Manuals £2545
  - Additional floppy drive £385
  - Silenteype printer £222
  - Qume Sprint daisywheel printer £1540
  - Profile 5Mb winchester drive £2256
  - Pascal £150
  - Visiocale £150
  - Universal parallel interface £135

**All prices exclude VAT; all products except Qume include one-year warranty.**

**Conclusions**

In a recent interview Steven Jobs, one of the Applefathers, expressed the opinion that people who are chasing 16 bits and more memory are in the wrong race; that software design is the key to the future. Certainly Apple III embodies this philosophy in that its processor is a second-generation workhorse and there is little that is startling (though much that is neat) in the hardware design. The voice of the computer scientist has been heard above that of the engineer in the development of the machine. The software environment around the III is more rational and sophisticated than that of its direct competitors and is also flexible enough to accommodate a lot of future hardware developments while maintaining program portability.

Whether or not it is a better buy than Sirius or IBM depends on how well the programmers make use of this sophistication, as neither CP/M nor SOS are really fit to be put in front of the end-user. The truly friendly operating system is still in the future; it may be in Apple's future with Lisa.

My thanks to Digitus for the loan of the test machine and to Lasky's for the Pascal system.
HAS THE BBC MICROCOMPUTER SENT AUNTIE OFF THE STRAIGHT AND NARROW?

Malcolm Peltu gets on his soapbox to question the validity of the BBC's computer literacy project.

The BBC is now in the commercial sponsorship business. It is also in the computer hardware and software business. I wish it would stick to what we pay our licence fee for, which is making good, independent TV and radio programmes.

The BBC hierarchy is apparently proud of its computer literacy project. As a propaganda arm of the Department of Industry and a sponsor of a British computer company, this project also pleases the Government, which is a good move for the Beeb at a time of tight monetary constraint. I find it appalling, however, that the BBC has moved so blatantly into the competitive commercial computing business.

The sponsorship of the Acorn computer has also seriously distorted the computer literacy project. It has made it seem that computing literacy and programming are synonymous. They are not. Computing literacy should be about understanding how to use, to exploit, to control and to manipulate electronic information systems. Programming techniques are a specialist aspect of the whole.

With unemployment so high, it is particularly disturbing that the BBC should link the project with a microcomputer costing at least £300. This helps to divide the haves from the have-nots.

Of course, you can watch the TV Computer Programme for free. But the little ad at the end tells it be known that you should really be able to afford a BBC microcomputer to be part of the 'computer age'. Before looking in more detail at why I object to some key aspects of the literacy project, I want to make it clear why I think it is an important project and why I believe it will be successful in parts.

The BBC has a well deserved reputation world-wide for its independence and quality. When it decides to go in for something in a big way, it provides a golden seal of approval.

ITV has produced a number of excellent programmes on computing, particularly Chris Evans's The Mighty Micro (which was a major prime-time breakthrough) and the Thames TV Living In The Future. But commercial TV and radio do not have the mechanisms to provide a concerted long-term project. The Open University has also made many even more excellent programmes on the same subject, but they are too tied into OU courses.

The Education operations of the Beeb, however, have the ability to plan long term and in-depth. The Continuing Education department, for example, has been responsible for a variety of projects in which the TV programme is the tip of an iceberg. These range from projects to teach maths to schoolchildren to the mass audience History on Your Doorstep. In addition to the TV programmes, there are books, enquiry centres, contact with local groups and a variety of other support services.

Their most notable success was the Adult Literacy campaign a few years ago, which set the pattern for the computer literacy project. A vital element in this information network is provided by the Broadcasting Support Services (BSS). In the computer literacy project, the BSS is running a referral service (contactable at PO Box 7, London W3 6XJ).

It has a computer with details of over 3,000 colleges, clubs and special agencies involved in computing. Information can be provided on courses, workshops, advice centres and other ways of satisfying enquiries.

Sheila Innes, head of TV Continuing Education, stresses that all projects are 'broadcast led'. This means that the starting point is the TV programme, which sets the tone and triggers off...
The micro absorbs a great deal of BBC energy and resources...it fundamentally distorts the public face of the project

simply, effectively and honestly without sponsoring a BBC microcomputer. Not only does the micro absorb a great deal of BBC energy and resources but it fundamentally distorts the public face of the project.

Instead of being broadcast led, the opening fanfare project has become computer led. The Computer Book, for example, is more of a support for the microcomputer than for the TV programme. The book is orientated towards personal computers and Basic, while The Computer Programme has a much broader sweep (see Book-fair in this issue).

Press publicity has been focused on the microcomputer for many months. Every twitch and sneeze from Acorn has reverberated, Letters in PCW, for example, have claimed that the project would be a success or failure because the BBC micro has this or that feature.

In the hoopla about the computer, the actual TV programme was forced to sneak out in the afternoon and early on Sunday mornings because the BBC wanted to dampen down demand for microcomputers.

So, we have the ludicrous proposition that a TV programme made for the general public to increase widespread awareness of computing has been scheduled to ensure that as few people as possible watch it until production problems on a commercial computer are ironed out.

Why then has the BBC compromised its independence and entered the commercial computer market? Trying to find out is like trying to catch shifting, whispering shadows.

When I first became peripherally involved in the project two years ago, the reason given was that the BBC had to ensure there were sufficient cheap computers to provide hands-on experience for viewers. This was always a nonsense because the problem was already being taken care of by the commercial manufacturers. It will be Clive Sinclair who will be remembered as making the breakthrough in hands-on mass computing, not the BBC or Acorn.

If the BBC, as the spec for the computer looked suspiciously tailored made for Newbury Laboratories' Newbrain. At one point, it really looked as if there would be a Beebrain. When the Newbrain hit production snags, there was a hasty revision of the spec which was equally hastily met by Acorn. Clive Sinclair was given an inadequate chance to tender.

It has been common gossip in the computer business that Acorn put together its offer at the last moment to meet high performance specifications at an unrealistically low price. When the price was hiked up in February, Chris Curry of Acorn admitted this.

The argument about needing hands-on cheap computers died out when the producer of The Computer Programme, Paul Kriwaczek, made it clear that the TV programme was designed to be independent of any computer.

Another argument given was that the BBC had to use a microcomputer in the TV programme, and that if it was used one from any particular manufacturer the others would complain. This is a non-argument. In any case, there is an IGG report Showing Apples, PETs, ZX81s, Atoms, etc. would be unlikely to rouse the ire of other manufacturers.

Far more likely is the anger has been generated by sponsoring Acorn. Sheila Innes recently summarised the latest reasons (I prefer to call them excuses) for having the microcomputer. The BBC, she said, had to ensure there was a modular upward expandable hardware on the market. And it has got into software publishing because the general quality of software was too low.

The Acorn Atom was as modular as the BBC Microcomputer - so why get Acorn to design a new version? And what special magic does the BBC think it has which will enable it to solve the software crisis? Companies like Peachtree are pouring in millions of pounds based on years of experience in order to test the commercial computer market. What is the BBC doing in this kind of business?

It was incapable of producing an adequate Universe for the microcomputer (early users get a provisional copy to be exchanged later). How can it be sure it will develop, test, market and support an adequate range of software?

Its software publishing activities are even more blatantly beyond its charter than the microcomputer. For the first time, BBC publicity will be publishing material produced by non-BBC staff which is not a direct spin-off from a broadcast programme. To argue that, say, a word processing package can be directly related to the Computer Programme is sheer hypocrisy. The BBC would not publish a video film on word processing made outside the BBC. Nor would it publish a generally accepted book on accounting by an outside author, although it might publish an accounting software package.

The list goes on. The BBC Microcomputer also compromises the BBC's editorial independence on computer matters. Could it really produce objective programmes evaluating or criticising microcomputers?

I am not the only person to dislike the BBC's move into flogging micros.

In the audience research carried out by the BBC for the computer literacy project, a majority of the survey agreed with the statement that it is with the BBC to market the products but right to pursue the rest of the project.

Why did the BBC really get involved with the micro? The wriggling excuses, which have changed rapidly, indicated that the actual reasons need to be hidden. Here are my guesses.

Firstly, the stumble towards the micro was egged on by the arrogance of the computer illiterate tempted by the opportunity to make money. It was obviously felt that a lot of money could be made out of the project by selling the computer, software and the book. They probably will sell a lot of books and computers. The BBC logo is a great advertising symbol. Whether it makes money out of the computer and software will depend on the success of the production and development aims of the operations. But even with the BBC sponsorship, this must be regarded as a sideline.

Secondly, the BBC is acting as an arm of Government industrial policy. The Department of Industry (DoI) has chosen a microcomputer manufacturer. Newbury Laboratories was one prime target. Acorn is another. Hence the sponsorship of the BBC Microcomputer in the DoI's Computers in Schools scheme. The DoI obviously saw the BBC project as a chance to create a way of funding industry through the back door (this government does not like directed subsidies, so does it through sponsored user projects).

Sheila Innes admitted that Managing The Micro, the first of the computer literacy programmes, was designed to be provocative. In other words, the aim is to sell, sell, sell the benefits of microcomputers.

This may be legitimate for the DoI. But I would have thought the aim of the Continuing Education department should be to create a critical and realistic (warts and all) appraisal of the technology and its impact.

If the BBC is to indulge in propaganda, this should be made clear, as in the Continuing Education series on stopping smoking and avoiding accidents in the home.

In summary, therefore, I believe the underlying concepts of the BBC computer literacy project are a golden opportunity to create a flexible network of information exchange and computing awareness. In practice, however, the BBC is misusing its image of quality and independence to peddle particular products in a competitive market which it has no right to be in.

I am afraid that the microcomputer and software publishing tail could strangle the computer literacy dog.
Eicon's dual 8" floppy disk drive system gives the Apple over 2 Megabytes of on-line capacity, enough, for instance, for 15000 items in stock control, or an integrated business system with several thousand accounts.

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POW/5/82
George Orwell had a vision that we would all be supervised by Big Brother in 1984. The micro industry has a view that we will all be assisted by Little Brother in about the same timescale. DP departments have, subconsciously at least, been identified as the agents of Big Brother, offering increasingly vast, inflexible and expensive systems with which users are unable or cannot afford to tamper.

The rapid acceptance of a desktop micro in big companies is in part a reaction against mainframe/DP department/Big Brother. The further progress towards Little Brother on all desktops with access to big databases is the likely outcome of revised DP attitudes, the incessant demands of users and the pressure of the new technology. There are conceptually two steps to take the large organisation into the Little Brother era.

Step 1 is the computer literacy programme. For the motor car to become a utility, automobile manufacturers had to break the everyman price barrier. And when the barrier was broken, everyman had to learn how to drive. The micro manufacturers have broken every person's computer price barrier, but not every person knows how to 'drive' a computer. A massive programme of, mainly, self-education is well underway. The first wave of microcomputers, as well as doing useful jobs, can be regarded as the main impetus towards computer literacy in companies. The Apples, PETs, Osborne and SuperBrains are reaching and teaching parts that DP has never penetrated.

Step 2 takes place at what I call the 'computer desk'. The computer desk of the mid-'80s will provide office workers with access to automated filing cabinets, electronic inter-office communication and external databases, be they on the organisational mainframe or on bureau machines. The computer desk will comprise all the software programs for office, managerial and professional staff and will provide multi access through networked facilities. There will be no practical limit to RAM and add-on store: you will have as many calculators and filing cabinets as you can afford/justify. The computer desk will offer new solutions to cheap mass store (winchester plus video disk) and new solutions to data entry (voice and direct image entry). In conventional computing terms we will be using 16 or 32-bit engines in desk enclosures with 1 to 2 megabytes of RAM. We will have strong fast communication cables and connect points around our buildings on a par with our telephone systems.

No crystal ball is needed to see these two steps towards mass computerisation. What is needed is time. Many of the elements for Step 2 are already with us in the form of raw technology. But they are seldom found altogether in one coherent, reliable and affordable system. And if they were, many organisations would not be ready because they have not even begun the first faltering step towards computer literacy. Some smaller companies which have never previously computerised will get the computer desk first; some large organisations (Unilever, BP, ICI, Allied Breweries) are well into experimental systems.

PART 5
HARDENING ON THE HARDWARE

no need to start on an odyssey to find one. Micros range from the small personal computer to the powerful networked facility, and no one company offers a credible range from top to bottom. Your standard, your bridge and your comfort is in software not in hardware. That said, there are some valid pointers to selection of standard hardware.

1. Be prepared to discard cheap experiments. We are surprised by the number of DP executives who have experimented on home computers and are not prepared to discard them in favour of more powerful, better-suited office machines.

2. Be prepared to write off computer literacy computers. You can afford to sprinkle your organisations with Osborne as education and personal productivity aids. In two to three years they will be homework computers, terminals on networks and education tools. Just be prepared to write them off in that timeframe.

3. Don't get the body of your micro thinking set in an IBM-like straight-jacket. Experimentation with several machines is a valid process towards assessing the best and seeing how they develop. Standard software will keep your options open.

4. Don't let your supplier think for you. Frankly, there are far too many developments in technology for any one supplier to have a monopoly - or even a majority. Mainframe suppliers offering micros are late in the field, more expensive and considerably less fleet of foot with new offerings than the specialist micro suppliers.

Microcomputer architecture

Two schools of architecture (the S100 bus and the propietory/own bus) have been adopted by microcomputer manufacturers. The common operating systems, and languages are available on both schools so that the choice you make will not inhibit your software standards.

Many microcomputers use separate printed boards for the processor, memory, interfacing, disk controllers, etc. These boards are connected by means of a bus, the standard one being the S100 bus which simply provides 100 internal connecting points. In a typical single-user microcomputer, about half of those connecting points are used.

The S100 bus has been adopted by the Institute of Electrical and Electronic Engineers (IEEE) and there is now an international standard for the bus. More than 200 manufacturers make products that can be plugged into S100 computers, eg, graphics cards, memory cards, interface cards, Prestel cards. As new technologies develop they frequently appear in S100 form because of the large market for products. The advantage of the S100 Bus can be summarised as: an international hardware standard; access to a variety of cheap add-on and alternative boards; easy to reconfigure from single to multi user; maintenance and fault finding made easy by board replacement.

The disadvantages of the S100 bus stem from its origins as an amateur design. There were flaws in the original design which have been reduced in subsequent implementations. As always, there is a trade-off to be made by adopting a standard. The disadvantages can be summarised thus: it's less reliable than single board architecture and it's less suited to more powerful processors than special-purpose architectures.
The S100 standard is especially useful in technical, scientific and educational establishments. Knowledgeable users can get into the machine, change the boards and do his own maintenance. On the other hand, the office user will rely on an engineer and will seldom look under the bonnet of his machine. Nevertheless, ease of maintenance and expansion by board replacement are important factors in selecting office computers. For example, upgrading to a multi-user system is simplified with S100 add-on boards.

Few of the widely used personal computers use the S100 bus, primarily because it is not compact enough and offers more facilities than are required. The following are among the manufacturers using it: Cromemco, Dynabyte, Industrial Micro Systems, Ithaca, Micromation, Transam, Morrow, North Star and Vector Graphics.

Some microcomputer manufacturers have developed their own bus structures, particularly the personal computer vendors. Many put all the essential electronic components of the computer on a single printed circuit board. Although there may be provision for adding special boards, they are basically single board machines.

The primary virtues of the 'own bus' machines are compactness, good reliability record, special purpose design.

Disadvantages compared to S100 architecture are that it's more difficult to diagnose faults and maintain them, they're more difficult to reconfigure and there's less choice of hardware add-ons.

The following are some of the machines with their own bus structures: Apple, Altos, Acorn, Atari, PET, Rair, Research Machines, SuperBrain, Sharp, Zilog.

8-bit processors

Two processors dominate the 8-bit microcomputer market: the MOS Technology 6502 and the Zilog Z80. The 6502 is widely used in personal computers. The best-known are the PET and Apple, with Atari a more recent member of the club. CP/M is not available on the 6502 but there are CP/M adaptors for PET (Softbox) and Apple (Softcard) which introduce a Z80 processor for those popular machines.

The Zilog Z80 processor has outlived even the 6502 and is to be found in such machines as the Tandy and the Sinclair at the lower end and just about all the popular office microcomputers.

The Z80 incorporates the instruction set of Intel's 8080 and provides a faster processor. CP/M is widely available. All the S100 micros mentioned use the Z80 processor.

A few years ago it was not apparent that the Motorola 6800 and the Intel 8080 would be also-rans in commercial microcomputing. Both these processors are widely used in intelligent controllers and industrial devices. A few computer manufacturers have used them, eg Rair uses an 8085 processor and South West Tech, one of the early micro suppliers, uses the Motorola chip.

16-bit processors

The market for 16-bit processors is a battlefield from which no clear victor has yet emerged.

Intel was first in the field and its 8086/88 processor has been adopted by a number of the existing Z80 suppliers, eg, Altos, Digital Systems, Dynabyte, MicroStar, as well as by some of the new entrants: IBM, Sirius, Convergent Technologies, Future Technology Systems. The 8088 cheap entry point offers only 8-bit external data paths but with 16-bit internal data handling. Available on IBM and the Sirius, it is not much more powerful than the Z80 but it does offer larger internal RAM capability. CP/M-86 is available for the 8086/88.

The Motorola 68000 chip offers a bridge from 16 to 32-bit and is being preferred by the more sophisticated system vendors, particularly those offering Unix. CP/M is not available yet, but a more advanced operating system is needed to take full advantage of the features of the chip and bridge to 32-bit. Manufacturers offering Motorola-based systems include Apollo, Charles River, Codata, Cromemco, Fortune Systems, Pacific Micro Systems, Dymec and Wicat. Apple is rumoured to be working on one also but after the Apple III difficulties it will be careful about premature release.

Zilog, manufacturer of the Z8000, has been one of the first to market a credible Unix system. Its system outperforms the PDP 11/70 by comparison favourably with the PDP 11/70 minis, at a fraction of the cost. The Zilog processor has not been widely adopted by other suppliers, Onyx being one of the few Z8000 users.

The 16-bit market is settling down into two dominant streams: Intel for mass 16-bit with a big impetus from IBM and Motorola for the more 'sophisticated' user, particularly spreading Unix and needing an impetus from a volume supplier, eg, Apple, Tandy.

Mixing mainframes and minis with micros

Understandably the mainframe and mini-computer suppliers feel threatened by the advancing hordes of micros. Genghis Khan could not have struck more fear into his enemies than the fright the technology has given the computer corporation executive. They are beginning to respond: some with carefully measured defences, some with ill-equipped ramparts and others by buying off the enemy. Their main hope for success lies in offering a coherent set of systems to their loyal followers.

At first sight, Data General appear to have a coherent set of systems. It made its mark in minis by offering an upward compatible set of software and it has continued this philosophy with cut-down micro versions of its software. The Enterprise and MPT desktop machines are based on the old technology 16-bit micro Nova and run under M/OS, a cut-down version of its software.

Data General introduced the Enterprise in the US with business packages developed by one of its OEMs on the bigger Nova range. The Enterprise has not been a commercial success. The offering is less competitive than the specialist micro suppliers with a lot less software. They may be attractive to some existing users but Data General has not struck the mass market chord. It has so far ignored the cheaper and more powerful new microprocessors, as well as the CP/M software explosion. It does not presently offer a bottom end home/personal computer although it could release a Z80 plug-in card to partially rectify the omission.

DEC has been offering microcomputers based on the LSI 11 chip set for some while. The offerings range from a dual 8/in floppy system up to a 40 megabyte/8-user PDP 11/23. The LSI 11 has been very successful but is now dated in comparison with the new 16-bit processors. DEC has developed a special 12-bit chip for its personal computer, the DECmate, which is selling in the US through its computer stores to offices, small business and professional users. The DECmate executes existing PDP/8 software but does not access the cheap micro software bank. For those
who want a CP/M machine, DEC offers a £1500 board that converts the VT100 terminal to a Z80 desktop computer supporting two floppy disks.

One tends to think of a large computer supplier as one company. In truth, because of the large suppliers' success in divisions and departments. Consequently it is not so surprising that the coherent set of systems often fall short of the items you want of the whole. The following table should be offered when you went their way in the first place. Hewlett-Packard's different machines illustrate the point.

If first produced a personal computer, the HP85, wide appeal to those using its calculators. About twice the price of the equivalent from Apple or PET, this is nevertheless a quality offering. It then announced the HP 126, a CP/M micro at about twice the price of its equivalent from the specialist Z80 suppliers, such as North Star Advantage or SuperBrain but with the ability to connect to HP's larger machines. Next, it announced the HP 9826, a Motorola 68000 desktop machine for technical applications such as graphics. After the 9826 came the HPS7, an upgrade of the HP85 with an optional Z80 + CP/M card for £327. Now, if all those machines could talk to each other and later be networked, there might be a coherent strand or an upward compatible set. Of course they are not designed to do so but they are directed to satisfy specific market niches, which takes us right back to the specialist micro suppliers, at half the price.

IBM's entry into the personal computer market surprised observers, not because of its technical innovation (its 8088 processor is only half a 16-bit) but because it read, inwardly digested and applied the basic principles on which the micro industry has grown so rapidly. It offers a low-cost personal computer with upgrades so that you can start learning and working at home. It is selling through retail outlets to reach the mass market as well as directly to its massive user base. It has chosen industry-standard hardware (Intel) and software, such as VisiCalc. And it is encouragingForum, where it stole a march on all others.

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dent vendors, such as packages from Personal Software, hard disks and net-
working from Corvus and Zynar, and the Z80 card from Micro-sof. The Apple
III is a disappointment, with poor price performance and so far with little soft-
ware support in the UK.
Altos provides a competitive range of
systems from a dual 8in floppy single-
user machine to a four-user winchester
disk system based on the Z80. More
recently it introduced an 8086-based
micro. It supports a wide range of
industry software including CP/M,
MP/M and Oasis operating systems. Its
single-board computer has a good reputa-
tion for reliability.
The Commodore PET is the most
popular personal computer in the UK,
though not quite so successful in its
home country, the USA. Commodore
offers a range of machines and the
8000, 96k PET is a popular option with
wide software support, such as Word-
craft and Silicon Office. The PET is a
6502 machine and CP/M is only available
through a Z80 add-on, the Softbox.
Cromemco was one of the early support of heavyweight micros and
was the first to offer winchester disks
in Europe and the US. Adopted by ICL
as its 'personal computer', Rair was the
first in the field with a mini winchester.
The company supports industry stand-
ard software and can reasonably be
expected to offer a 16-bit implementa-
tion on the 8086 in the near future.
The SuperBrain is the popular CP/M
personal computer from Inteerie. Early
gain the CP/M reputation based on the Z80.
Floods and winchester disks are also
shared hard disk facility available from Inteerie for the
SuperBrain, called the Compute.
The Tandy Model I is an often-,
(fg, Video Genie) popular home and
personal machine with wide software
availability for both TRS DOS and CP/M.
It's a low-cost machine with not the
best reputation for support. Tandy also
produces a business micro, the Model II,
and has recently announced a top-range
Motorola 68000-based machine.
Vector Graphics started about the
same time as North Star but has
developed a range well beyond North
Star and comparable to Dynabyte. It
has a good reputation for reliability and support.

Some new contenders
An analysis of the micro suppliers
would not be complete without at least
a passing reference to a few of the
newer contenders.
Adam Osborne first made his name
as a writer and publisher of some of the
standard works in microcomputing. He
established Osborne Computer Corpor-
What's what in processors and bus structures

<table>
<thead>
<tr>
<th>Microcomputer manufacturer</th>
<th>8-bit processors</th>
<th>16-bit processors</th>
<th>Bus structure</th>
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</thead>
<tbody>
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<td>Apple</td>
<td>Z80</td>
<td>8086</td>
<td>Own bus S100</td>
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<tr>
<td>Altos</td>
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? = Rumoured but not released

The fifth commandment of microcomputing is: thou shalt not worship
at the altar of your main supplier. IBM is rightly admired for its technical
innovation and marketing muscle. But it does not have all the answers; some of
the answers it provides are too late; and some of the answers are downright
wrong. Mainframe users tell stories about waiting 18 months for new equip-
ment, only to find it fulfils half its specification. They also tell horror
stories about the IBM Series 1 which took several years before it became
a good product. Of course there is some risk in going with the specialist micro
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END
Mannesmann-Tally's new MT100 series of matrix serial printers for microcomputers is now available from local computer shops and suppliers.

MT100 series printers are utterly reliable. They're a new generation of Europrinters made in West Germany with full technical and service back-up from our headquarters here in the UK.

They give high performance at a very reasonable price. Ideal for professional businesses. Or educationists. Or enthusiasts who value the latest technology.

**Two basic models – MT120 and 140**

Main difference is in column width. The MT120 is the 80 columns version whilst the 140 features 132 columns.

Both models come in three variants giving a range of standard features which normally are beyond the scope of microcomputer orientated printers.

- 9 x 7 matrix, 160 cps high speed output – often doubled by microprocessor control choosing shortest possible print path in either direction.
- Selectable 18 x 40 matrix for high definition correspondence quality.
- 10 different character sets, 96 characters each. OCR A and B character fonts using 9 x 9 matrix.
- Four different character pitches between 10 and 20 cpi, each of which can be printed in double width.
- Two colour printing.

All MT100 series printers are small, quiet and highly versatile. End user prices start at £390.

For further pricing and availability use the MT100 hotlines on Reading (0734) 586446/7/8 or look in at your computer shop. Alternatively write to us for full details.
Dual floppy disk drives. Two 5¼" floppy disk drives provide 100,000 characters each of data storage, or about 60 pages of typed, doublespaced text.

Diskette storage. The floppy diskettes can be removed, providing infinite permanent information storage. Two compartments provide storage for up to 25 diskettes.

RS-232C Interface. Enables the OSBORNE 1 to connect with serial printers, or other devices using this popular industry-standard interface.

IEEE 488 Interface. Connects the OSBORNE 1 to the standard instrumentation bus, for data communication with test instruments.

It doesn't need a room of its own. Or even a desk of its own. With its optional battery pack, in fact, it doesn't need mains electricity for up to two hours.

It's - as you can see - portable. Weighing under 24lb in its weatherproof case, it can be carried in one hand. Or tucked under an airline seat.

But its performance is equal to, often better than, small business computers several times as big and twice as expensive. The OSBORNE 1 will achieve in seconds commercial, engineering, or scientific calculations which, without a computer, would take days.

And store a whole library of data for instant retrieval and use any time.

For £1,250* the only personal business computer excluding VAT.

See the Osborne 1 at any of these authorized dealers:

LONDON
Adda Computers Ltd, Mercury House, Hangar Green, Ealing, London W5 3BA. Tel: (01) 997 6666

Business Computer (Brettona) P.L.C., 90-92 Brompton Road, London SW3. Tel: (01) 583 5294

Bristol Computer Centre, 324 Euston Road, London NWI. Tel: (01) 387 0505

Osborne 1. It needs no room of its own. Or even a desk of its own.

Osborne 1.

Osborne 1.

Connected to a printer, it will operate as a word processor and produce letters, documents, reports - anything you want word- (and figure-) perfect.

And carry out financial planning, too, using an electronic spreadsheet, providing fast, accurate cash flow forecasts and instant answers to those important 'what if' questions.

You can see an Osborne 1 - and try it out - at any of the dealers listed below.

And then happily walk away with it.

CAMBRIDGE
Cambridge Computer Store, 1 Emmanuel Street, Cambridge CB1 1RE. Tel: (0223) 503345

CHESTER
McKibben Berrington, The Forum, Northgate Street, Chester CH1 2DD. Tel: (0256) 30167

DERBY
Opinion House Centre, Quickway House, Derby DE1 1SE. Tel: (0332) 300005

EDINBURGH
McKibben Berrington, 4 St James Centre, Edinburgh EH1 3SR. Tel: (031) 556 2914

GLASGOW
McKibben Berrington, 79/100 Argyle Street, Glasgow G1 1UN. Tel: (031) 556 2914

GUILFORD
Systematic Business Computer, 82 Guildford Street, Guildford GU1 5DF. Tel: (0483) 32666

LIVERPOOL
McKibben Berrington, 14 Castle Street, Liverpool L2 1AD. Tel: (051) 232 5535

MANNHEIM
McKibben Berrington, 14 Castle Street, Liverpool L2 1AD. Tel: (051) 232 5535

NEWCASTLE
Sage Computers, Whitley Green, Newcasle upon Tyne NE1 1HQ. Tel: (0662) 40405

NOTTINGHAM
Mackinlay Berrington, 14 Castle Street, Liverpool L2 1AD. Tel: (051) 232 5535

Preston
Mackinlay Berrington, 14 Castle Street, Liverpool L2 1AD. Tel: (051) 232 5535
Standard software

Five outstanding software packages, with a retail value of over £800 are included:

- CP/M® Operating System
- WORDSTAR® with MAIL MERGE®
- SUPERCALC™  MBASIC®
- CBASIC®

Optional extras

- Modern cable for use with acoustic couplers for telephone transmission of data
- Battery pack
- Double density disk drives with 200K bytes of storage per drive

Internal electronics. Z80A™ CPU, 64K bytes RAM memory (60K available to the programmer, 4K used to run the screen.) System software is held in ROM in a separate address space.

Screen. Clear, 5", 24-row screen displays a 52-character window on a 128-character line with automatic horizontal scrolling.

Monitor Interface. Connects the OSBORNE 1 to any monitor screen.

Keyboard. A standard typewriter keyboard plus numeric, adding-machine keypad for fast entry, and cursor control keys for easy cursor movement.

Case. The plastic case snaps together to form a weatherproof, 24-pound package that fits underneath the standard airline seat.

For further information and full specification, return the coupon to The Marketing Manager, Osborne Computer Corporation (UK) Ltd, 38 Tanners Drive, Blaxellands North, Milton Keynes, Buckinghamshire MK14 5BW. Telephone: 0908 615274. Telex 825220

More information on Osborne 1, please.

Name _______________________
Address _____________________

PCW/5 __________ Tel _____________________
more than just hardware and software at good prices.

We supply Apple hardware and software to care for your financial modelling, accounting, word processing etc.

But at Guestel that's not the end of the story. We supply GUESTELCARE - care to ensure that the system you chose is tailored to meet your specific requirements. We also train all operators to achieve maximum efficiency from the system.

After you have purchased your system Guestel care continues with night and day technical and operational support.

Our care also extends to our prices, we take care to keep them as competitive as we can.

Clip the coupon or call into our showrooms and let Guestel care for you and your micro.
COMPUTER ANSWERS

Send your queries to: Sheridan Williams, 35 St Julian’s Road, St Albans, Herts. Please note that Sheridan can no longer answer questions on an individual basis, so please don’t send an SAE with your query.

Beeb group

I am waiting for my BBC micro and so, I gather, are many thousands of other people. I would like to obtain information on the machine, to start thinking about how to use it straight away. Is there a user group that I could join, or is there any way in which I can obtain information?

G Williams, Sheffield, J Riggs, Gosport, J Woods, Hampton, and others.

I am becoming overwhelmed by the number of enquirers asking similar questions and late in 1981 I established a user group called BEEBUG, the Independent BBC Micro Users Group. Our first newsletter came out in April and established us as a viable concern. So the idea of going to Apres we had in excess of 1000 members, of whom only 20 percent had actually got machines. We can offer a great deal more than any BBC or Acorn-run group. If you require further details please write enclosing an SAE to BEEBUG, PO Box 50, St Albans, Herts, SW

Language books

Do you know of any books that you can recommend on the languages C, Algol 68, and Lisp?

D J Danziger, Whitefield, Manchester.

I cannot recommend any books in particular, but know of the following:

Computer Language Reference Guide, published by SAMS; this is a guide that covers the most common languages and costs about £7.


Lisp, published by Addison Wesley at about £6.

VIC talk

Is it possible for me to get my VIC to speak?

Philip Richardson, Lindfield, Sussex.

If you are thinking of trying to program the sound generator to produce speech, then forget it. Speech in humans is produced as a result of the coaction of the vocal cords but also movement of the air cavities in the mouth. Electrically, this means passing the sound through a filter whose characteristics are quite complicated and can be varied at a rate and manner which is extremely difficult to follow. The way it normally advanced these days is to use a dedicated speech synthesis chip. These are designed to be programmed by the computer to produce the desired words.

Ron Geere, IPCUG

Hi-res plot

Is there any way of plotting characters on the Apple hi-res page? If so, how?

G Keen, North Shields

There are a number of ways of using the hi-res page to plot characters, some of which use a set of shape tables. There have been many articles in the British magazines over the past year, and there are more in the American magazines eg, Call A.P.L.E. They can be slow and are easily programmable and can be used to add labels to graphs, etc. Unless you have had plenty of experience with shape tables, then it is advisable to find one of these articles or to get hold of another ready-made program. One of the first was a program Apple had in the set of disks called 'Contributed Software', which was available free in the USA and at a nominal charge over here a few years ago. Much of it was in Integer Basic. You may find an Apple dealer who knows about it. As it doesn't seem to be available now, so, a speed of being shouted down for advertising the British Apple Systems User Group yet again (PO Box 174, Watford WD2 6NF), you could join us and get hold of it and other similar programs for the Apple. It includes the Apple Programmer's Assistant, which allows you to remun and find where variables are in the lines of your program; it also writes the line numbers for you and much more. But the important point is that it contains a hi-resolution character generator (HRCG) which allows you to define your own character sets and edit them. There is also a program to run the HRCG so that you can write your own think programs and change into upper and lower case and between different sets of symbols. If you use the Apple as a normal type writer. It does not allow you to use the shift key. You can use it to label graphs, etc, but more exciting is the graphics facility to allow larger characters to be built up by joining others together and then animating them. The HRCG in the DOS Toolkit is limited to normal size characters and all the text is in white although with larger groups of shapes, colour does become possible. If you wish to type in text and have large coloured graphics characters, then there is a more sophisticated package called 'Higher Text', from Synergistic Software. This has some advantages in that larger (in fact normal and large) character fonts are available, and colour with the larger font, but it is harder to use. It too has an editor, which allows you to modify the fonts provided or to make up your own.

John Sharp, BASUG Secretary

Worth joining?

Can you tell me whether it is usually worth joining a user group? I am mainly thinking of joining the Pascal Users group, although I am considering joining a user group for my machine also.

E Bolton, Barnstaple

The answer depends upon what you value your money. You may probably belong to a union without ever stopping to consider whether it constitutes value for money — it is difficult to judge. A user group can only be judged by what it offers and what it has offered.
Can you plan ahead for growth?

Can you recognise a good prospect when you see one?

Have you a nose for the right kind of deal?

Can you talk our language?

Are you prepared to stick your chin out?

Have you got what it takes to take what we’ve got?

It takes a lot to become a Canon dealer. But if you’ve something to offer us, we’ve certainly something to offer you.

Achieve agreed targets for the Canon CX-1 computer range and we’ll give you a hefty 5% additional bonus to use for extra advertising. That’s on top of your standard margin.

Canon Computer dealers have so many advantages.

Limiting the number of dealers will prevent the dubious practices other personal computer dealers suffer. And make destructive price wars unnecessary.

No more competition from direct selling – the CX-1 range will be sold exclusively through our chosen dealers with the help of Canon’s national Back-up team. And heavy-weight advertising support from summer onwards.

We’d welcome your application to become a Canon Computer dealer, but be warned – we didn’t get where we are today without being choosy.

To give you the full story face to face, we’ve organised a Nationwide Canon Computer Roadshow. It’ll be in your area between April 28th and May 26th.

For your free invitation please contact Liz Horsley or Alex Glickberg on 01-680 7700 or write to them at Canon (UK) Ltd., Waddon House, Stafford Road, Croydon CR9 4DD.

Canon

The next step forward
Monitor or TV? I am considering buying a 12in or 14in TV for my TRS-80. Would you please explain why I should consider buying a TV rather than a TV because, as far as I am aware, a monitor is only a TV without sound? Ian Robertson, London

The main difference you can expect to see between a TV set and a monitor is the quality of the picture. Each line on the screen is drawn by an electron beam which moves along the screen about 40 microseconds. The width of the smallest dot that can be displayed depends on how long it takes the amplifier to brighten the beam and then return it to the dimmer state. As you will realise, it needs an amplifier that will respond in a microsecond or two. The TV, however, takes a cycle of response from dark to bright and back at the rate of 60 or 143 cycles a second. You will see advertisements for monitors that quote their ‘bandwidth’ as 22MHz, for example. The bandwidth you need depends upon the number of dots you wish to resolve along a line. With a TRS-80 the graphics are fairly coarse so the finest detail you need is on the character display, where you want 8x64 dots for maximum sharpness. This is 512 dots in 40 microseconds and seems to call for a bandwidth of about 12MHz. Domestic TV usually doesn’t have a bandwidth higher than about 3MHz, it is hard to get a good monitor there at 84 characters per line. At 80 characters I don’t think anyone would regard an ordinary television. But I presume you will not want colour for the Tandy so you can choose whether to buy a new monitor (there are some quite cheap ones advertised) or a secondhand one (mine cost £39; it’s ex-ICL and I take the risk that if it breaks I may be unable to get anyone to fix it). Mind you — a wide bandwidth alone is not enough. It’s no good having an amplifier that can display fine detail if the signal to it gets blurring. In order to make their output simple to connect to a domestic television most micros convert their display output with a UHF modulator so that it will go in through the aerial socket. This does the sharpness of the picture no good at all. The UHF modulator blurs it and the television decoder blurs it some more. It is much better, if the television has what’s called a monitor input, to connect the unmodulated signal from the micro to that. Television sets that have this facility are also likely to have the best bandwidth. As it happens, I too am looking for a dual-purpose display and TV to fit buying one of each and it is more important in my case because I want colour; I have found there are a few (rather expensive) colour TV sets that have a monitor input, I can’t yet recommend one, however.

Anthony Camacho

Flying Is it possible to get a computer to fly ‘graphically’ through a landscape, or are the mathematics involved too complicated? Would it be possible for the BBC Computer to do this? Bobby Hesselbo, North Berwick, Scotland

Your question and a number of others seem to have been stimulated by the excellent Horizon programme on computer graphics. In principle, the process of displaying a perspective view as the viewpoint is ‘flying’ through a computer model of a landscape or an architectural model (such as the one of down-town Chicago in the Horizon programme) is quite simple. The model is held in store and for each frame of the display the appropriate calculations to convert what would be seen from the viewpoint into a perspective view then have to be done. The skill lies in choosing a way to hold the model which allows the conversion to perspective to be done rapidly enough for the display not to be boring. I think it might be possible for a microcomputer to do this with a fairly simple model, at a very slow speed. The sort of machines that are used to do this commercially are at least 100 times the speed of the common 8-bit micros such as the BBC machine. Until the other day I would have been more discouraging, but I have had an opportunity to see what can be done with a BBC model ‘A’ — it drew 1000 (admittedly random) lines in 28 seconds! Enough to excite the Tandy/PET/Pascal/Appleowners among us go quite green!

Anthony Camacho

Language query I am interested in a language that will load into 32k of memory, for a 2860A and give 10-digit accuracy with some guard digits (say three) and fast numerical routines. Is there anything available, or can you recommend a book on machine code routines for both integer and floating-point computations? C W Williams, Cockermouth, Cumbria

You do not mention your type of machine but if you can operate under CP/M, or have a North Star computer you can use North Star Basic, which is available in a number of precisions, up to 14 digits. North Star Basic can language called run under CP/M using the

SoHo Group’s Matchmaker II program. If you have a North Star machine, a special ‘floating point arithmetic’ 8-digit package is available which considerably increases the speed of calculation. If you do not want to depend on an assembler, rather than an interpreter, then CBASIC-2 offers a similar 14-digit accuracy and the added speed of compiled programs.

The technique used to increase precision, which is general application, is this to hold numbers in binary-coded decimal form, rather than as ordinary binary.”

Flying point numbers. Multiple-precision machine code arithmetic routines are covered in many books.

One reference to hand is How to Program Micro-computers by W Barden, Jr, published by Sams. P L McIlmoyle

Assemblers wanted Do you know of any commercial source for a PROM-based assembler for the 68000 or an appropriate assembler listing? Similarly, how about the 6809 and the 6808? Finally, are you aware of any software house which markets ‘simulator’ software for the 6800 and the 6809?

Dr J A McLean, Napier College, Edinburgh

I am sorry that I cannot help as regards PROM-based assemblers, and would be grateful if any readers could assist here.

As you know, the 65xx(x) range of micro-processors are much like the Motorola, and in view of the technical depth of your interest I would suggest that you should contact Motorola’s UK office at York House, Empire Way, Wembley, Middlesex HA9 0PR, tel 01-902 8836. Motorola does, of course, have assemblers available for the micro-processors you mention. Assemblers for the 6800 and 6809 are also available from Technical Systems Consultants, Box 890, 1920 Avenue, West Lafayette, Indiana 47906, to work under the Flex operating system. The Micro-Soft/Soft/Soft books include an assembler language covered in many books.

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CALCULATOR CORNER

602 IN QUIRK HORROR PROBE!

By Dick Pountain

Spring is in the air and calculators turn quirky. In the space of ten days I have received letters from three readers announcing that the Casio 620p does have a 'quirk' almost a year after I tested it and pronounced it quirk-free. These long memories may recall that the selfsame thing happened with the 502; it's almost (but not quite) enough to make one believe in the paranormal.

To summarise the discovery briefly, it is found that an extra 37 characters can be produced in the 602's display — namely those which are normally reserved for the representation of program instructions in the Write Mode. The way to in them depends on the fact that, in a typically economical Casio design, when in Alpha Mode the 602 interprets the same codes that stand for program instructions as Alpha characters. The program then is to fool the calculator into thinking it's in Alpha Mode when it's not (or not in Alpha Mode when it is, or something), which turns out to be quite possible. It's possible because the signals to switch modes are the automatically inserted quotation mark characters (""") which the calculator always expects to find in pairs, delimiting an alpha string. If we can produce an unpaired quotation mark the required hoax will be perpetrated on the operating system.

Readers Tony Smithurst of Manchester and Andrew McLeod of Wimbledon independently discovered two different ways to accomplish this, which have different practical implications. An honourable mention also to Mark Edwards of Stoke Poges who reported a similar method to McLeod's a few days earlier.

I'll describe McLeod's method first as it doesn't involve tape operations.

Clear the program registers and input the following program:

```
PO LBLO "ABCDEFGHJKL... abcde.. 0123.. .017 in write mode:-
```

The group of instructions between LBLO and "B" have been translated into alphas. The "B" LBLO is put there to allow the program to end in non-Alpha Mode which it does because B translates into GOTO1. A complete translation is needed.

Here's how you do it. We wish to display a certain alphabet character in the display: -

```
P0 LBLO "ABCDEFGHIJKLMNOPQRSTUVWXYZ" LBLO M+12 MR04 cos M+13 MR2 "B" LB1. Do the HLT AC GOTO0 AC and you should be rewarded by: 
```

"4 / 2" was obtained.

The following program: -

```
GOTO 1
```

in programs in order to label outputs? The method, just explained to show you how it works, is not very convenient since it requires a lot of manual intervention. The halt and GOTO0 and clearing can only be done by hand from the keyboard. We might as well use the technique as an output subroutine. This is where Tony Smithurst's contribution comes into the picture.

Tony discovered the 'locked-in-alpha trick' by a different route; namely by stopping the loading of a program from tape in the middle of an alpha-string. The effect is just the same but it opens up the possibility of storing a blank 'skeleton' program on tape, editing into this the expression you wish to display, and then running this as a normal program with no HLT AC GOTO0 AC needed.

Here's how you do it. We wish to output results from a statistics routine in the format "X% Y%" when numbers X and Y where the two numbers are stored in M01 and M02.

Put the following program in P0:

```
P0 "AAAAAAAAAAAXXXLBLO LB1."
```

Now save it on tape using INV SAVE EXE. Clear the program memories and prepare to load this same program. As soon as the P000 appears, to show that the calculator has found the program, hit AC to abort the load. Now switch to Write Mode and inspect the contents of P0. You will find as many 'A's as it had managed to load before the abort and the balance made up of those empty output results from a statistics routine in the format "X% Y%" when numbers X and Y where the two numbers are stored in M01 and M02.

Now clear the tape.

```
```

Tonys method first as it doesn't involve tape operations.

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```

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While thanking you for your Eiconet/Pascal review, I would like to point out the following errors where it concerned Pascal.

1. There is absolutely no clash between the Pascal and Eiconet software; the object I sent you was a one-off bodge.

2. The Benchmark timings you publish are rather uncomplimentary as the production system is substantially faster.

The Pascal system is fully available on disk for the System 3/4, and available in limited quantities (ie, I am having to blow and assemble the EPROM's myself) as a plug-in for the Atom. It should be fully available sometime soon - meantime I enclose some recent Benchmark times (and also the local mainframe's efforts). Sorry our floating point is a bit slow, but we do calculate to 40 bits of precision.

Paul Farrell, Acorn Computers Ltd

I accept that in the 20-odd Benchtests on which I have collaborated there must have been errors and omissions. There are limits to the amount of checking one can do in a short time, but I guess that we try to check the bulk of our facts before we publish. In this instance, and since he brought it up, perhaps Mr Farrell will permit me to remind him of the telephone conversation made explicitly to check these points during which he denied all knowledge of the Eiconet software.

I am pleased, however, to publish the above as an incentive to manufacturers and software producers who are courageous enough to submit their 'bogdes' for a preview. Nevertheless, even Mr Farrell must appreciate that we can only review new systems as we find them and not as their designers hope they'll turn out.

You might be interested in the enclosed timings for a couple of Data General Mini-computers. One is a Nova 12/20 using the RDOS single user operating system, the other is an Eclipse 5/140 using the AOS operating system with only one user active during the timings.

The Nova system was developed at Lancaster University from the original Zurich p-code compiler. It produces compacted p-code which is interpretively executed. The design sacrifices some execution speed to allow large programs to be run.

In developing the AOS version I have not taken full advantage of the extended instruction set of the Eclipse computer, and the actual code executed for the Benchmarks was virtually identical, the improved performance being due to the improved processor design, particularly noticeable being the introduction of a hardware floating point unit in the Eclipse.

The department is currently considering distributing the AOS version and would like to hear from any interested parties or potential users.

Dick Whiddett, Centre for Computer Studies, University of Birmingham

That floating-point on the Eclipse looks really impressive. It's a shame you couldn't run MATHS as well.

Distasteful as it is for us to blow our own trumpet, the lack of anyone else doing it for us in this country has forced us to do it ourselves. When the Benchmarks first appeared, we ran them on our then current releases of Lucidata Pascal and, apart from a few glitches which I believe have been covered by others in the months since, were content that at least a comparison Benchmark existed. We then sat back and awaited the appearance of the first set of data run with our Pascal, submitted naturally by one of the thousands of ex-Lucidata Pascal users world-wide, or at least from one of the many hundreds in the UK. Thus the following issues were not only a shock but also a disappointment, for I have shown that no one has even submitted a 68XX based result, let alone one of ours. Shades of the American magazines' saturation coverage of all things 8080 I thought and dug out the old disk labelled PCW-BENCH.

I must emphasise that I do not believe such results to be worth anything at all as a means of comparison unless more information is provided and printed alongside the data. In particular, when an 8-bit micro tries to do floating point arithmetic its performance is very dependent on how many bytes are being used to represent a REAL. Mind you, when it comes to the transcendental functions, it is clear from the results so far published that the choice of algorithm far outweighs any effect of REAL emulation.

Lucidata Pascal uses 5-byte REALS, giving about 15 decimal digit precision for REAL arithmetic and all the functions, 2-byte signed INTEGERS, 8-byte ALFAs, 16-byte SETs and 1-byte BOOLEANs, scalars and CHARacters. It will operate on the minimum hardware needed to support the DOS, which in the case of FLEX 3.0 from TSC is 16k + 8k. The run-time system automatically enrolls a compiled module of execution if there is insufficient memory to hold everything in core. It only requires a single 5in floppy disk drive for storage and object code accordingly.

The submitted data were obtained on a 2 MHz GIMIX 6809 with 56k and 9600 baud terminal running FLEX 3.0 and a 1 MHz SWPZ 6800 with 10k and 9600 baud terminal running FLEX 2.0. Versions of Lucidata Pascal are being marketed for Smoke Signal Broadcasting 6800 under DOOS81 and Heath HS9 under HS9 under DOSDOS. I will attempt to get the Benchmarks run under these systems also.

Finally, as there seems to be a lot of nationalism creeping into editorial material these days: Lucidata (release 1) was conceived and developed in the Netherlands (ECC) three years ago by two British passport carrying persons, Dave Gibby and myself. Does this qualify it to be called 'wholly British'? Dr Nigel Bennie, Lucidata Ltd

Thank you for your timings. I too have been waiting for 6800 and 6809 figures to emerge. Perhaps you'll get a few more enquiries now.

I enclose my findings with respect to Digital Marketing Inc's Pascal/M. I will be happy for you to make use of this information in PCW provided that they publish my list of small ads, also enclosed, that have been outstanding with them for an obscene length of time.

Jonathan Vickers, Farnborough, Hants

Since your figures have been passed on to me I assume your ads have been aired?

We have recently completed the development of a Pascal compiler, to run therein a virtual CP/M, which generates native 280 machine code. The system, called Pro Pascal, will shortly be available. It is a full implementation of the proposed ISO standard, with the exception of conformant array parameters which, as no doubt you know, are currently the subject of intense international disagreement and debate. There are a small number of extensions, the most significant being a facility for separate compilation of program segments.

We have run your PCW Benchmarks on our own equipment (a 4 MHz Cleno Conqueror) and obtained the timings shown. To time the first test, we enclosed it within a further 20-fold 'magnifier' loop; for the others we upped the loop count to 30,000, to get more measurable elapsed times, and divided the results by 3.

We can not enclose the times for the same Pro Pascal object programs executed on a Superbrain. This has a memory-mapped screen with transparent refresh. Since 24x80 positions have to be refreshed 50 times a second, this costs 96000 microseconds per second, and the timings are indeed about 10 percent greater. This is yet another hardware variation to be compounded with the one you already take into account (wait states).

Our implementation has a maxint equivalent to a 32-bit value (ie, 2147483647), but recognises subranges that can be accommodated in a 'word' (16 bits) or a byte, and optimises storage and object code accordingly. For the purpose of the Benchmark, 'integer' was redefined as a 16-bit

PCW 139

Chris Sadler presents more timings and correspondences for PCW's Pascal Benchmarks
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subrange (ie, TYPE integer - 32767. .

In the circumstances, we would expect you to look for some independent verification of these timings, and would be happy to provide facilities for you to do so, if you so desire, to run any checks you wish to make.

Tony Hetherington and Mike Oakes, Prospero Software

PS: Are you the C Sadler who is joint author of a book on Pascal (pub Springer-Verlag) which was reviewed in the Computer Zeitung?

Your figures certainly are very fast indeed. To answer your question, yes, I am that C Sadler and thank you for bringing the computers that do run UCSD Pascal to my notice. However, anyone with a completely

We would be most grateful to hear if you know of a full UCSD Pascal including units, long integers and strings, implemented on North Star/Comart Communicator or any CP/M system. We would also be glad to know of any small computer systems that do run UCSD Pascal. Thanking you in anticipation.

J O Hodgson, Estate Computer Systems, Sleaford, Lincs

I am grateful to Mr Hodgson for giving me the opportunity to declare an interest - since the last Pascal Benchmark article appeared I have become the publicity officer for the remainder of the p-System User Group (USUS/UK).

To my knowledge, the p-System has been implemented on the following Z80 systems. Where the book is being reviewed, are you the Prospero Pascal that keeps on mentioning my Benchmarks in your ads?

I have been reading your Pascal Benchmarks with interest and enclose a set produced on one of Manchester University's CDC 7600s. As you may know, this machine was (when introduced) the world's most powerful computer, but it has now been superseded by the Cray-1. One of the features of this impressive machine is a very fast hardware floating point unit which contributes to its peak instruction rate of 400 mips (million instructions per second).

A couple of notes about the Benchmarks.

1. To ease the production of the figures (and to save machine resources) I have put all 15 Benchmarks into one program. Also for timing I have used the compiler's built-in parameter-less function CLOCK which returns the total CPU time used so far by the job. In doing this I have allowed for the time to print the results and read the clock.

2. The machine's speed shows up best in MATHS (10 milliseconds). If the loop were increased to 10,000 to give a more reasonable figure, it is easy to see that it would be faster than all except MAGNIFIER, REALALGEBRA and REALARITHMETIC.

The time command was 0.277 seconds, the remainder being machine overheads associated with every job. The machine's speed shows up best in MATHS (10 milliseconds). If the loop were increased to 10,000 to give a more reasonable figure, it is easy to see that it would be faster than all except MAGNIFIER, REALALGEBRA, REALARITHMETIC, FORLOOP and LITERALLASSIGN.

Some time ago you published some times for my Pascal system running your Pascal Benchmarks, together with some encouraging remarks about extending it to support REAL variables. I have now done so, and made a number of other extensions including some improvements to the generated code. I enclose the new timings for the Benchmarks for my own system, which I have labelled Molimerx since they market it and for the UCSD system, both running on the TRS-80 Model I. Thank you again for the magazine's coverage of Pascal.

T J Bourne, Hemel Hempstead

Thank you for the new timings incorporating REALs - you must have tightened your code up quite a bit. I have taken note of the change in name.

Here are the results of running your Pascal Benchmarks on the various Unix systems at Queen Mary College and on the PERQ. Note that several different compilers were involved, so the figures do not give a measure of raw hardware performance. The PDP11s use the Vrije University Pascal Compiler. The former of these uses operates software simulated floating point operation (see MATHS, REALALGEBRA and REALARITHMETIC).

I am grateful to T J Bourne, Hemel Hempstead, for the timings and for supplying the Pascal UCSD (which runs on all the above bar the Microengine) in the next few months. For details of these machines or how to order them, contact Malcolm Harper at North Star (Horizon and Advantage), Philips P2000, Research Machines, Superbrain, Tandy TRS-80 and Zenith Z 899.

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PASCAL UPDATE

Thus two mathematical function calls take about the same time as a 10-step FOR loop containing one integer assign!

These timings could be further enhanced by changing the default options on the compiler to inhibit runtime checking (array bounds and subranges) and suppress the code to enable post mortem dumps to be produced.

The compiler used is one for Pascal 3 (Pascal 6000 - V3.2.0) which is probably the same one used on Imperial College's Cyber 174, as Manchester University's Cyber 170/720 dual system also uses this compiler.

In conclusion, I hope you are able to use these Benchmarks. I realise that the 7600 isn't exactly a personal computer (at several mega-pounds) but I feel your readers would be interested in the results produced by a high-performance mainframe.

Roderick Buchanan, Stockport

Wow!

And finally here's a complete listing of the PCW Pascal Benchmarks Suite.

---

**Program Memory Access**

```pascal
program memoryaccess;
var j,k:integer;
begin
  writeln ('s');
  for k := 1 to 10000 do
  for j := 1 to 10 do 1 := j;
  writeln ('e');
end.
```

**Program Real Arithmetic**

```pascal
program realarithmetic;
var k:integer;
real;
begin
  writeln ('s');
  for k := 1 to 10000 do
  writeln(k); // k := k/2434-5;
  writeln ('e');
end.
```

**Program Real Algebra**

```pascal
program realalgebra;
var k:integer;
real;
begin
  writeln ('s');
  for k := 1 to 10000 do
  writeln(k) := k/4+4-k;
  writeln ('e');
end.
```

**Program Vector**

```pascal
program vector;
var j,k:integer;
matrix:array[0..10] of integer;
begin
  writeln ('s');
  for k := 1 to 10000 do
  matrixE0] := 0;
  writeln ('e');
end.
```

**Program Equal If**

```pascal
program equalif;
var j,k:integer;
begin
  writeln ('s');
  writeln ('r'); // j := 0;
  writeln ('e');
end.
```

**Program Reference**

```pascal
program reference;
var j,k:integer;
begin
  writeln ('s');
  if j = 1 then 1 := 0;
  writeln ('e');
end.
```

**Program No Parameters**

```pascal
program noparameters;
var j,k:integer;
begin
  writeln ('s');
  procedure none;
  writeln ('e');
end;
```

**Program Math**

```pascal
program math;
var k:integer;
x,y:real;
begin
  writeln ('s');
  for k := 1 to 1000 do
  writeln (sin(k));
  writeln ('e');
end.
```
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The unprecedented popularity of the ZX Series of Sinclair Personal Computers has generated a large volume of programs written by users. Sinclair has undertaken to publish the most elegant of these on pre-recorded cassettes, each program is extensively vetted for interest and quality, and then grouped with other programs to form a single-subject cassette. Each cassette costs £3.95 (including VAT and p&p) and comes complete with full instructions. Although primarily designed for the Sinclair ZX81, many of the cassettes are suitable for running on a Sinclair ZX80 if fitted with a replacement 8K BASIC ROM.

Some of the more elaborate programs can be run only on a Sinclair ZX Personal Computer augmented by a 16K-byte add-on RAM pack. This RAM pack and the replacement ROM are described below. And the description of each cassette makes it clear what hardware is required.

8K BASIC ROM
The 8K BASIC ROM used in the ZX81 is available to ZX80 owners as a drop-in replacement chip. With the exception of animated graphics, all the advanced features of the ZX81 are now available on a ZX80 – including the ability to run much of the Sinclair ZX Software.

The ROM chip comes with a new keyboard template, which can be overlaid on the existing keyboard in minutes, and a new operating manual.

16K-BYTE RAM pack
The 16K-byte RAM pack provides 16-times more memory in one complete module. Compatible with the ZX81 and the ZX80, it can be used for program storage or as a database. The RAM pack simply plugs into the existing expansion port on the rear of a Sinclair ZX Personal Computer.

Cassette 1 - Games
For ZX81 (and ZX80 with 8K BASIC ROM)

- ORBIT – your spacecraft’s mission is to pick up a very valuable cargo that’s in orbit around a star. SNIPER – you’re surrounded by 40 of the enemy. How quickly can you spot and shoot them when they appear?

- METEORS – your starship is cruising through space when you meet a meteor storm. How long can you dodge the deadly danger?

- LIFE – J.H. Conway’s Game of Life has achieved tremendous popularity in the computing world. Study the life, death and evolution patterns of cells.

- WOLFPACK – your naval destroyer is on a submarine hunt. The depth charges are armed, but must be fired with precision.

- GOLF – what’s your handicap? It’s a tricky course but you control the strength of your shots.

Cassette 2 - Junior Education: 7-11-year-olds
For ZX81 with 16K RAM pack

- CRASH – simple addition – with the added attraction of a car crash if you get it wrong.

- MULTIPLY – long multiplication with five levels of difficulty. If the answer’s wrong – the solution is explained.

- TRAIN – multiplication tests against the computer. The winner’s train reaches the station first.

- FRACTIONS – fractions explained at three levels of difficulty. A ten-question test completes the program.

- ADD/SUB – addition and subtraction with three levels of difficulty. Again, wrong answers are followed by an explanation.

- DIVISION – with five levels of difficulty. Mistakes are explained graphically, and a running score is displayed.

- SPELLING – up to 500 words over five levels of difficulty. You can even change the words yourself.

Cassette 3 - Business and Household
For ZX81 (and ZX80 with 8K BASIC ROM) with 16K RAM pack

- TELEPHONE – set up your own computerised telephone directory and address book. Changes, additions and deletions of up to 50 entries are easy.

- NOTE PAD – a powerful, easy-to-run system for storing and retrieving everyday information. Use it as a diary, a catalogue, a reminder system, or a directory.

- BANK ACCOUNT – a sophisticated financial recording system with comprehensive documentation. Use it to keep track of ‘where the money goes,’ and at work for expenses, departmental budgets, etc.

Cassette 4 - Games
For ZX81 (and ZX80 with 8K BASIC ROM) and 16K RAM pack

- LUNAR LANDING – bring the lunar module down from orbit to a soft landing. You control attitude and orbital direction – but watch the fuel gauge! The screen displays your flight status – digitally and graphically.

- TWENTYONE – a dice version of BlackJack.

- COMBAT – you’re on a suicide space mission. You have only 12 missiles but the aliens have unlimited strength. Can you take 12 of them with you?

- SUBSTRIKE – on patrol, your frigate detects a pack of 10 enemy subs. Can you depth-charge them before they torpedo you?

- CODEBREAKER – the computer thinks of a 4-digit number which you have to guess in up to 10 tries. The logical approach is best!

- MAYDAY – in answer to a distress call, you’ve narrowed down the search area to 343 cubic kilometers of deep space. Can you find the astronaut before his life-support system fails in 10 hours time?

Cassette 5 - Junior Education: 9-11-year-olds
For ZX81 (and ZX80 with 8K BASIC ROM)

- MATHS – tests arithmetic with three levels of difficulty, and gives your score out of 10.

- BALANCE – tests understanding of levers/fulcrum theory with a series of graphic examples.

- VOLUMES – ‘yes’ or ‘no’ answers from the computer to a series of cube volume calculations.

- AVERAGES – what’s the average height of your class? The average shoe size of your family? The average pocket money of your friends? The computer plots a bar chart, and distinguishes MEAN from MEDIAN.

- BASES – convert from decimal (base 10) to other bases of your choice in the range 2 to 9.

- TEMPERATURE – volumes, temperatures, and their combinations.

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The simplest of these types of manipulation is translation, which involves moving the object in one or more planes without altering its size or shape. New coordinate values are calculated by:

newx = oldx + distance to be moved in x-direction

with similar equations for Y and Z. Figure 2 shows a simple example of translation.

Scaling
Scaling has the effect of increasing or decreasing the size of the object. This can be done either uniformly or in just one or two dimensions. Figure 3 demonstrates the scaling of a cube. Mathematically, scaling takes this form:

newx = oldx * scaling factor in the X direction

newy = oldy * scaling factor in the Y direction

newz = oldz * scaling factor in the Z direction

Similarly, the equations:

newx = oldx * scaling factor in the X direction

newy = oldy * scaling factor in the Y direction

result in a change of size in two dimensions. Figure 4 shows the Z rotation described. Besides these operations, there are some ancillary manipulations that must be performed on the object to make the image appear correct when drawn on the TV screen. They are perspective transformation and clipping. Displaying a three-dimensional object on a two-dimensional screen makes it necessary to flatten the image. However, to avoid losing its three-dimensional effect, the Z coordinates of the points must be converted to offsets in the X-Y plane. This requires perspective transformation which is mathematically represented as:

newx = oldx * scaling factor in the X direction

newy = oldy * scaling factor in the Y direction

newz = oldz * scaling factor in the Z direction

This gives an object perspective from a point at zero on the Z axis.

Rotation
Rotation can be applied about any of the three axes. The angles of rotation (that is, the degree of turn) are denoted throughout by THETA, PHI and PSI. They correspond to the Y, X and Z axes respectively. Rotating a point about one axis will change coordinates on the other two axes. For example, rotation about the Z axis can be written mathematically as:

newx = oldx * cos θ - oldy * sin θ

newy = oldy * cos θ + oldx * sin θ

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148 PCW
Because Y=0 is at the top of an Atari screen, it is necessary to change the sign of the Y coordinates at this point. The coordinate values of the points are now in the same coordinate system as the screen although some values may exceed the boundaries. In order to construct the image from these points, a data table or similar is necessary to indicate which points join to each other. Using this, a pair of points can be taken ready to draw a line. However, before drawing the line it is necessary to determine its position with respect to the observer. A line is only visible if it is in front of the observer, and at least partly on the screen area. Thus a test to see if the line is behind the observer must be performed.

If the Z coordinate of a point is negative it means that the point is behind the observer. A line is not drawn if both the Z coordinates of its points are negative, but if one of the Z coordinates is positive then the part of the line in front of the observer must be drawn. The line is drawn from the visible point in the opposite direction to the apparent position of the invisible point. The line is continued until it reaches one of the screen boundaries. This reversal is necessary because perspective offsets in the X-Y plane suffer a change of sign if the Z value is negative.

It is possible that a line is outside the boundaries of the screen, and a test must be performed to determine whether both X or both Y values of the points are off the screen in the same direction. If this is so then the line is not drawn. However, if both X and Y are off the screen but in opposite directions the line may cross the screen and still need to be drawn. If the line is to be drawn but one or both points are outside the screen boundary, then the line must be clipped. To do this, the slope of the line is found and the boundary value that the line crosses is used to calculate the new coordinate. This is done first for the X and then the Y coordinates. An example of the use of this clipping procedure is given in Fig 6.

Fig 6 Example of clipping in the x-y plane.

The line B2 now lies totally within the screen boundaries, but under certain conditions a line may still lie outside and a final test is performed before the line is drawn.

I have left certain more complex aspects of 3D graphics such as colouring the faces of an object and hidden line removal. These are not impossible on a micro, but make the process of generating an image more time-consuming, and are out of the scope of this article.

The program

Initialisation (590-660): this routine dimensions the arrays and reads in their...
initial values from data.

Manipulation of data (20-110): lines 30 to 76 perform rotations about the three axes; line 90 scales the image, carries out the perspective transformation and centres the image on the screen.

Line preparation (420-480): this routine contains the point connection table and, using this, it selects pairs of points and passes them to the draw routine.

I have used a shortcut here and sent the line to the draw routine without first clipping it. If the line is off the screen then Atari generates an error condition. If an error occurs, the trap statement on line 350 causes the program to jump to line 455 which sends the line to be clipped and redrawn before returning to the main routine.

This 'shock horror' technique is used because Basic is able to test for an errant line much faster than I can and this cuts the routine down from 14 seconds to 6 seconds.

If you wish to use this program on a machine with neither trap nor ON ERROR GOTO statements then delete line 450, remove the POP statement from line 455 (POP just removes the top value on the stack and is used if a subroutine or FOR...NEXT loop has been jumped out of). Also, remove the trap statement from line 350.

Control routine (500 to 570): most of this routine is Atari specific but it would not be difficult to rewrite for another machine. This routine takes a value from the Atari joystick and its trigger and from this performs the required modification to angle or distance.

The two POKES on line 610 make the keyboard speaker click when the joystick is moved and set the attract flag to zero to prevent the Atari from going into its colour cycling routine.

Clipping routines (120-410): this routine performs the clipping in the X, Y and Z directions and then sends the line to be drawn.

If you wish to change the image displayed you will have to change the point coordinate data on lines 610 to 630 and the connection data on lines 460 to 480.

If you use a different number of points you must change the array sizes on line 590 and the FOR...NEXT loops on lines 40 and 660. If you use a different number of lines then you must change the FOR...NEXT loop on line 430.

You will get the best results if you centre the image about the zero point in each axis. If your new object is very large or very small you may wish to change 3 on line 590; this is the initial distance of the observer from the object.
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P.C.W. 82 Chesterfield Road, Matlock, Derbyshire DE4 5LE. Telephone: 0629 4995. Telex: 377482 Lowlec G.
Alan Sutcliffe unveils a simple algorithm which produces complex results.

My first attempts at using a computer to make patterns relied on complexity: the complicated manipulation of random values and the construction of intricate programs to simulate randomness.

By reaction, this led me to look for simple methods of pattern generation and almost 10 years ago I invented a simple algorithm called Skip and Divide. This article describes this method, which operates on a set of intervals along a line and shows some elaborations of it for making two-dimensional patterns.

Suppose a line is divided into several sections or intervals, from left to right.

These are the rules of Skip and Divide:
1. Start at the left-hand end, alternately dividing an interval and skipping over an interval. When an interval is divided, the new right-hand interval produced does not count as the next interval to be skipped: it will be divided or skipped the next time round the cycle.
2. After the right-most interval has been skipped or divided start again at the left: the ends of the line can be considered to be joined together.

Although these rules are best understood initially when there are several intervals to start with, the simplest way to begin is with a single interval. Look at Figure 1: cover up all but the very top of the picture leaving just the tops of the two end lines showing. The space between is the starting interval. Now follow the rules: starting with the left-most interval (the only one at this stage) divide it. Uncover the next level of the picture to show this line in the centre. As you are now at the right-hand end, move back to the start. There are now two intervals. Skip over the first and divide the second. Uncover the next level of Figure 1 to show three intervals.

As you are again at the right-hand end return again to the start. Continue in this fashion, alternately skipping and dividing intervals.

Each run along the line from left to right I call a generation. In the first three generations only one interval is added to each cycle, but in the fourth generation and all the subsequent ones two or more new intervals are added.

Figure 1 shows the first nine generations. The bottom part of the picture shows how each generation looks in this form like a set of spectral lines from a photo-chemical analysis. Program A produced Figure 1. Lines 140 and 150 set the end points of the starting interval. At the start of each generation the coordinates of the division points are copied back from B into A and a vertical line is drawn at each division point. Lines 230 to 300 are the main loop in which each alternate interval is divided, the new values being put into B. M is the marker, alternately 0 and 1, to indicate whether to skip or divide each interval. For divide, the mid-point of the interval is calculated and entered as the new coordinate. I is the pointer to the items in A, and J is the pointer for B. N is the number of intervals currently represented in A; there are N+1 points for N intervals, the left-most point being in A(0).

Every interval is divided
If N=2n is even at the start of a generation, then n new intervals will be formed to give 3n at the start of the next generation.

If N=2n+1 is odd, there will be 3n+1 intervals at the start of the next generation if the first interval in this generation is skipped, and 3n+2 intervals if the first interval is divided.

When an interval is divided in one generation, then one or other but not both of the 2 new intervals formed will be divided again in the next generation. Can any interval remain undivided for all further generations? In Figure 1 the interval at the right remains undivided from the third to the seventh generation, when it is divided.

I mentioned this question once to Lambert Meertens of the Mathematical Centre in Amsterdam when we were on a course together. The next day he
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brought a proof that every interval is divided sooner or later, it goes somewhat like this.

Take an interval that has just been skipped and suppose that there are now \( N \) intervals including this one. If \( N \) is odd the interval will be divided at the next generation. If \( N=2n \) is even then the interval will be skipped at the next generation, and immediately after it has been skipped there will be \( 3n \) intervals. So whether it is skipped or divided at the next generation will depend on whether \( 3n \) is even or odd. From this it can be seen that the interval will remain undivided for \( r \) generations where \( r \) is the largest power of \( 2 \) that divides \( N \). For example, if \( N=40-2^4 \cdot 5 \), the interval will be skipped three times and divided the fourth time.

Circular display
Since the procedure treats the set of intervals as a cycle, it is natural to show the division process acting on a circle as in Figure 2. The original interval of 360 degree starts and ends along the x-axis. Once again the different generations are shown by a shortening line. The program for this manifestation of the process is obtained from Program A by the following amendments.

Dividing a square
The two forms of pattern so far shown from the algorithm are still essentially one-dimensional, though stretched into two to make them viable. I have made some graphics by overlaying two versions of Figure 1 at rightangles, but this seems arbitrary and hardly disguises the linear form. Here is how to generate a properly two-dimensional pattern from the Skip and Divide rules.

The pattern is composed of areas that are either square or a rectangle formed by dividing a square horizontally in two; each such rectangle may itself be divided by a vertical line to give 2 smaller squares. Thus dividing a square gives two rectangles and dividing a rectangle gives two squares.

In all that follows the upper rectangle of a pair just formed is considered to come before the lower one, and the left-hand square of a pair just formed is taken to come before the right-hand one. Look at Figure 3(a). The original square has been divided into two rectangles, and at the next generation the upper rectangle has been skipped and the lower one divided. Figure 3(b) shows the next generation with the upper rectangle again skipped and the left-hand square divided. The next generation, this time with two more divisions, is shown in Figure 3(c). The order, upper before lower, left before right, is observed in all subsequent generations.

The result after 13 generations is shown in Figure 4, and was produced by program B. Each area, square or rectangle, is stored as the coordinates of its upper left corner (\( UA, AV \)) and its lower right corner (\( AX, AY \)). \( AT \) records whether the area is a square (0) or a rectangle (1). This information is used when the area is divided, and its two offspring are always of the opposite type. The overall flow of the program is much the same as for the first one. In lines 100 to 190 the initial values are set up. \( KK \) controls the main loop for the generations. The first inner loop again copies the \( B \) arrays into the \( A \) arrays, and also draws each square or rectangle.

The second inner loop generates the new areas. If the area is to be skipped (\( M=0 \)), then the \( A \) values are simply copied into the \( B \) arrays. If the area is to be divided, the upper left corner of the first offspring and the lower right of the second offspring are the same whether the area is a square or a rectangle, but the other coordinates
depend on the type — hence the test for $T$ in line 500.

It is clearly wasteful to plot the outline of each area: it would be enough just to plot the new dividing lines, once the initial square has been drawn. To make this more efficient still the whole diagram could be stored in terms of lines not areas. But Program B is an intermediate stage and the data for areas is needed for the next version of the program.

Figure 4 shows 13 generations. The reason for stopping at this point is not that the limit of the screen resolution has been reached: in fact only the middle resolution on the DAI is used for this display, and using the highest resolution at least two more generations could be shown. The reason is that the limit has been reached on the size for the arrays: 256 elements. The 14th generation has more than this number of areas.

The next development, to solid areas, is given in Figure 5. Instead of plotting the outlines of the areas, nothing is plotted until the last generation is reached. Then each alternate area is filled or left blank in place of being divided or skipped. The amendments to Program B to give this output are given as Program C.

**Truly two dimensional**

At last a truly two-dimensional pattern has been formed, but there is a sacrifice: now only the last generation is displayed and the earlier history is not shown. So the final development to be presented is a way of showing several such generations at once.

Look at Figure 6. This is a way of arranging squares on a plane. After square 1, there are three squares of the same size at each level, and from one level to the next the length of the side of the square is doubled. The succeeding generations can now be shown in these squares.

The gradual increase in the size of the main square roughly keeps pace with the increasing detail in the higher generations, so that the smallest area at each level is about the same. Figure 7 shows the result of this concatenation of the first 13 generations, and the boundaries of the areas have been left in, by retaining lines 262 to 268. Figure 8 is the same display without the boundary lines. Notice that the top right-hand corner of this design is the same as the whole of Figure 5: the 13th generation.

**Some variants**

There are many variations to be played on these programs. First the basic rhythm of alternating skip and divide can be changed, for example, by skipping every third element. To make Program A skip-divide-divide simply replace $M=1-M$ in line 290 with $M=(M+1) \mod 3$. Another refinement is to add colour. Where several generations are shown at once they can be coloured differently. In a single generation, say for Program C, the areas can be coloured cyclically, for example blank-grey-white. This final colouring cycle need not be the same length as the cycle used for skipping and dividing.

And, to leave you with a slightly boggling extension: to three or more dimensions. The same procedure can be applied to a cube with divisions parallel to the faces. The rule for ordering the new volumes would have to be extended: left before right, upper before lower, and front before back. I am still waiting for the invention of an effective three-dimensional computer display device.

All the illustrations for this article were taken from the screen of my DAI computer using a Polaroid SX-70. The characters in Figures 3 and 6 were generated by software: see Patterns in PCW January 1982.

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Welcome to the confusing world of the microcomputer. First of all, don’t be fooled; there’s nothing complicated about this business, it’s just that we’re surrounded by an immense amount of necessary jargon. Imagine the words and phrases we are about to explain with a radix of 16 in which the letters A to F represent the values 10 to 15 when instead we can simply say ‘hex’. No doubt soon many of the words and phrases we are about to explain will eventually fall into common English usage. Until that time, PCW will be publishing this guide — every month.

We’ll start by considering a microcomputer’s fundamentals and then face the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, processing it, storing the results or sending them somewhere else. All this information is called data and it comprises numbers, letters and special symbols which can be read by humans. Although the data is accepted and output by the computer in ‘human’ form, inside it’s a different story — it must be held in the form of an electronic code.

This code is called binary — a system of numbering which uses only Os and Is. Thus in most micros each character, number or symbol is represented by eight binary digits or bits as they are called, ranging from 00000000 to 11111111.

To simplify communication between computers, several standard coding systems exist, the most common being ASCII (American Standard Code for Information Interchange). As an example of this standard, the number five is represented as 0010101 — complicated for humans, but easy for the computer! This collection of eight bits is called a byte and computer freaks who spend a lot of time messing around with bits and bytes use a half-way human representation called hex. The hex equivalent of a byte is obtained by giving each half a single character code (0 — 9, A — F): 0 = 0000, 1 = 0001, 2 = 0010, 3 = 0011, 4 = 0100, 5 = 0101, 6 = 0110, 7 = 0111, 8 = 1000, 9 = 1001, A = 1010, B = 1011, C = 1100, D = 1101, E = 1110, F = 1111. Our example of 5 is therefore 35 in hex.

The computer processes data by re-shuffling, performing arithmetic on, or by comparing it with other data. It’s the latter function that information, processing it, storing the results and to modify a byte (POKE).

Moving on to hardware, this means the physical components of a computer system as opposed to software — the programs needed to make the system work.

At the heart of a microcomputer system is the central processing unit (CPU), a single microprocessor chip with supporting devices such as buffers, which ‘amplify’ the CPU’s signals for use by other components in the system. The packaged chips are either soldered directly to a printed circuit board (PCB) or are mounted in sockets.

In some microcomputers, the entire system is mounted on a single, large, PCB; in others a bus system is used, comprising a long strip of wire holding a number of interconnected sockets. Plugged into these are several smaller PCBs, each with a specific function — for instance, one card would hold the CPU and its support chips. The most widely-used bus system is called the S100.

The CPU needs memory in which to keep programs and data. Microcomputers generally have two types of memory, RAM (Random Access Memory) and ROM (Read Only Memory). The CPU can read information stored in RAM — and also put information into RAM. Two types of RAM exist — static and dynamic. All you really need know is that dynamic RAM uses less power and is less expensive than static, but it requires additional, complex, circuitry to make it work. Both types of RAM lose their contents when power is switched off, whereas ROM retains its contents permanently. Note that manufacturers often store interpreters and the like in ROM. The CPU can only read the ROM’s contents and cannot alter them in any way.

Serial I/O involves sending data one bit at a time along a single piece of wire, with extra bits added to tell the receiving device when a byte is about to start and when it has finished. The speed that data is transmitted is referred to as the baud rate and, very roughly, the baud rate divided by ten equals the number of characters per second.

To ensure that both receiver and transmitter link up without any electrical horrors, standards exist for serial interfaces. The most common is RS232 (or V24) while, for parallel interfaces to printers, the Centronics standard is used.

Finally, a modem connects a computer, via a serial interface, to the telephone system allowing two computers with modems to exchange information. To do this, a modem must be connected to the telephone or a computer and the phone system. British Telecom isn’t so uptight about the use of these.

NEWCOMERS START HERE

This is our unique quick-reference guide, reprinted every month to help our readers pick their way through the most important pieces of (necessary) jargon found in PCW. While it’s in no way totally comprehensive, we trust you’ll find it a useful introduction.

Happy microcomputing!
The layout has been designed to allow you to discover 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 look up the supplier's name and telephone number in the table below.

All details published are the latest available — some may have changed since this issue went to press.

### Packages

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### Database management

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<td>PET/CBM</td>
<td>£30</td>
<td>B1</td>
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<td>PET/CBM</td>
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<td>PET/CBM</td>
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<td>PET/CBM</td>
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<td>PET/CBM</td>
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<td>B1</td>
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<tr>
<td>Apple II</td>
<td>PET/CBM</td>
<td>£500</td>
<td>T4</td>
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<tr>
<td>TAP business system</td>
<td>PET/CBM</td>
<td>£125</td>
<td>H2</td>
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PACKAGES
Machine

Application

Price

Code

Payroll
Payroll
Payroll
Payroll
Payroll
Payroll
Payroll
Perpetual Inventory
Personnel records
Product ion analysis
Property management
Property management
Purchase ledger

£500
£390
£450
Lease
£425
£500
£450
£150
£450
£700

135

Purchase ledger
Purchase ledger
Purchase ledger
Purchase ledger
Purchase ledger
Purchase ledger
Purchase ledger
Purchase ledger
Purchase ledger
Purchase ledger
Purchase ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger

Solicitors

S/L, P/L

1-

WI
86
T4
MS
B5

C4
C4
£450-1000 C4
£400
M3
£500
L3
£450
GI

Time ledger

Utilities
Word processing
Word processing
Word processing
W0g0 processing

WO in progress
amos

Ctigtomer file

MCZ Ziloc

511-801,

B3

T4
M5
L3
C4

GI

LI
B5
S7

M3
B3

WI
B6
T4

M5
M5

£500
£400
£200
£350
£50
£400
£150-260
£250
£250
£850

113

B5

GI
C4
M3
136
135

M2
M2
M2
M2
612

M2
M2
11

II

WI
P2
P2
135
315

Financial modelling

£95

B5

£250
£400
£400
£750
£250
£975
£950
£990
£690
£900
£100

133

E250

M3

£100
£350
I:150
£195
£90
£350
£390

E35

Mail shot
Payroll
Payroll
Payroll
Property Management
Purchase ledger
Purchase ledger
Purchase ledger
Sales ledger
Sales ledger
Sales ledger

WI
FI5

513
135

£8

H3

£8
£650

84

B5
113

B3
543
B5

B5
133

M3
M3

WI
M3
133

N13

Lease

WI
M3

£250
£400
£400
£250
£400
£400

information retrieval
information retrieval

S3

information retrieval
information retrieval
information retrieval

Sorcerer

POR

CI

Superbrain

£325

AI

£225

134

£250

C3

145-250
£150

S3

information retrieval

information retrieval

131

Estate agent
Estate agent
Estate agent

£25

AI

£30
£250

H3

File handling
Financial modelling
Financial planning
General ledger/NL
General ledger/NL
General ledger/NL
General ledger/NL
Incomplete records
Industry factory
loading
Industry work study

£225
£425-535
£125

H4

1200
£1000
£200

C2

POR
£750

S3
S3

£300
£750

XI
XI

Integrated accts
Integrated accts
Integrated accts
Integrated accts
Integrated accts

f300

13I

£(501

C2

£650
£650
POR
POR
£25-50

02

Invoicing
Invoicing
Invoicing
Ins °icing
Invoicing
Job costing
Lotteries

Mailing list
Mailing list
Mailing list
Mailing list
Mailing list
Mail shot
Membership acct ice
Payroll
Payroll
Payroll
Payroll

Payroll

S3

Al

AI
CI
H3

JI
HI

E350

Al

£400
POR
£750

CI

£45
£75
£15
£45

112

£35
£100
£125
£85
£150
£150

Ill

112

H3

(42
JI

4.50,195

B2

£250+
1400
£300
£400
£300
£400
£300
£900
£450
£200
£250
£800

£25-80
£90
£40
£350

POR
£40
£75 +
£249
£90
£90

S6

M3
S6

M3
S6

M3
T3
M3
M3
S6

M
M
M
M
M

M
04

M
M
M
M
G4

04

175
£75

1-12
.11

Mailing list
Mail shot
Mail shot

package

£1000
£250
£12
£300
1200
POR
f 95z 120

S3
S3

Purchase ledger
Sales ledger

113

11

Stock control/recording E300
Time/cost recording
FOR
Travel Agency Accts
£225
Travel Agency Diary
£100

350

Al

Travel Ticket Sales
Word processing

£1000
£300

CI

£3511

133

POR
FOR
(200

S3
11

£300

Database management/

134

information retrieval

£95,350

AI

£350

113

P013

S3

£375

M3
T3
M3

MI
MI
MI
MI
MI
MI

H3

Word processing

S6

£90
£350
£90
POR

£160

£75/150
£85/65
L40/20

M3

General ledger/N1.
Integrated accts
Invoicing
Job costing

£85

350

T3

MI
MI

£10

Stock control/recording £150
Stock control/recording £300
Stock control/recording £150
Stock control/recording £150
Stock control/recording £195
Stock control/recording £12/25/

M3

andy Model II

C5

131

2

.1

S6

G4

CI

114

M3

POR
£50/75

Al

Purchase ledger
Purchase ledger
Purchase ledger
Purchase ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sales ledger
Sates ledger
Sales ledger

S6

£225

POR
£.200/350

Prise lister
Production analysis
Purchase ledger
Purchase ledger
Purchase ledger

M3

Travel Ticket Sales
1 ime/cost recording
Word processing

195

Printers job control

S6
S6

Database management/

Payroll
Payroll
Payroll
Personnel recors
Petsoft programs
PR/advertising

Tektronix

£75 +
£90
£90

£225
£175-240

G4

MI
MI
MI
MI
G4
(34

G4

MI

Various engineering

El

Packages
1 RS -80

Database management/

information retrieval

1

£60

S2

£32.50

HI

information retrieval
General ledgerNL
Incomplete records

£150
£225
£40

HI
HI

Integrated accts

175

Investment portfolio
Invoicing
Mailing list

£20

S2

£25

HI

Database management/

C.2
111

02
JI
12

£25/38/
55

AI

G2
C2

132

M3
M3
C9
M3

E150
£140
£90
£400
£390

Stock control/recording £30-50
Travel Agency Accts
£225
Travel Agents Dairy
£100

H2

f75/150

£350
£350

S6

£350

Purchase ledger
Sales ledger

S3
S3

31

Estate Agent

E I 50

Mailing list
Mail shot
Payroll

AI

£75/150

M3

T3

Incomplete records
Integrated accts
Invoicing
Job costing

1:150

00/25/

L2

£450
£300
£800
£400
£400
£750
£1200
1990
£1000
£250

information retrieval
General ledger/NL

XI

12

£250

Bill of materials

Travel agency accts

Tandy Model I

S3

195

Payroll

Stock control
Stock control
Stock control
Time recording
Word processing

11

SI
SI
SI

Stock control

Purchase ledger
Purchase ledger
Sales ledger
Sales ledger

S3

SI

P2
P2
P2
P2

Incomplete Records
Integrated Accts
Integrated Accts
Integrated accts
Invoicing
Invoicing
Job costing
Letter writer
Mailing list
Mail shot
Payroll
Payroll
Payroll
Property management

Database management/
Disk operating system

£595
£395
£395

S3

£450
£300
£300
£300

Database
Estate agent
General ledger
General ledger

Database management/

information retrieval

General ledger
Sales ledger
Purchase ledger

Database management/

H3

WI

Sharp PC -3201

Database management/

information retrieval

£75/150

Solicitor's package
£750
Stock control/recording £395
Vet package
POR
Warehousing
POR

31

£25

M3

SI
SI
SI
SI

Purchase ledger
Sales ledger

G2

VAT master
Word processing
Word processing
Word processing
Word processing

B3

Mailing list
Planning maintenance

£150

Al

£250
£200
£450
£250

CBM/8032

L150

£17.50

Time/cost recording
Time/cost recording
Time/cost recording
Word processing

RI

BI

VAT

85

Stock control/recording £250

C2

M3

B5

PET/
Computhink

£50/150

B3

133

M3

C5
H3

£75

Stock control/recording £15
Stock control/recording £300
Stock control/recording £35/25
Stock control/recording £100/250
II 25
TAP business system
£300
Time/cost recording
Time/cost recording
POR
Utility set
£78

B5

£325
135
£120

Al

Database management/

Code

Al

B2

C2

Price

f25/325

132

/12

Application
Word processing
Word processing
Word processing
Word processing

Database management/

B3

M3

Machine

Database management /

M3

1:400

SL, PL + stock
control
£900
Stock control/recording £450
Stock control/recordng £900

General ledger/NL

S3

II

General ledger z NL

Wing List

PCC 2000
Simpelec

I4
(El
513

Estate agent

Invoicing
Invoicing
Invoicing
Job costing
Letter writer

1100

L3

M3

B3

Integrated accts
Integrated accts
Integrated accts

S3

£1000

S7

£250
£750
£750

Integrated nets

£100
£50
£100

Assembler dev
Bank acounts

136

£95
Budgeting package
£95
Cash flow
Database management/

General ledger 'NE
General ledger/NL
Incomplete records
Incomplete records
Incomplete records

Appointment planner

WI

£195
£150

information retrieval

BM

£425
£500
£400
£500
£500
£450
£425
£200
£275
£400
£350
£300
£425
£500
£400
£1250

Estate agent

Double glazing costing

PI I

£300

Stock control/recording £150
North Star
Horizon

82

Database management/

£250
£250
£400

Integrated accounts

Stock control/recording £350
Time/cost recording
£350

C4
85

Mail shot
Membership accting
Personnel records

Stock control

312

LI

Word processing

Integrated accts
Motor dealer
Payroll

(Ode

1450
£350
£350

£425
£500
£200
£275
£400
£350

£1000
£1500
£2000
£5000
£1500
£1500
£500

Data base

Price

Mail Shot

Bonds/pension
quotations
Bureau de change
Cash flow
Credit control
Database management/

£900
control
B5
Stock control/recording £325
LI
Stock control/recording £500-1500 C4
Stock control/recording £350
GI
85
Stock control/recording £500
Stock control/recording £900
M3
£550
B3
Stock control
WI
Stock Control
£300
£500
T4
Stock control
M5
Stock control
£550

Time/cost recording

Application
Purchase ledger
Sales ledger

B3

S./L, P/L + stock

Surveying
Time/cost recording

riton 3

M3

stock

control

Machine

A2
B4
H3
S3

Mailing list
Payroll

£50-150
£200

Purchase ledger
Sales ledger
Statistics

£225
£225
£45

HI
S2

HI
HI
HI
S2

HI

H3

Stock control/recording £200
Stock control/recording £48
Stock control/recording E115
VAT register
£15
145/95
Word processing
Word processing
Word processing

HI

112

BI

st

H2
H4

E15

31

HI
JI

£30/60/
90

TRS-801

S2

S2

f75

TI
TI

£218

T1

E225

TI

General ledger/NL
Invoicing
Payroll

£225/325

Purchase ledger

PCW 167


Providing exactly the right facilities for different applications can be a real problem when a system is as versatile as the 380Z.

Take, for example, screen line length. Not only do different users have different needs, so too do individual users. They might welcome forty character clarity for presentation, display, and control applications; but they also want eighty character capacity, because word processing, some programming languages, and many general-purpose applications demand it.

So we've developed Varitext — to provide both, on the same machine.

Varitext means that the 380Z user can always choose the line length best suited to the application. It gives access to a growing range of 80 character software without losing all those well-established and popular 40 character applications. It makes the 380Z equally effective as a computer and a word processor. It lets programmers use the character mode with which they are familiar — or which languages like ALGOL, FORTRAN, and PASCAL really need.

And it improves the quality of our already exceptional graphics, by offering a smaller character size for neater annotation.

But the Varitext option goes a great deal further than that. We also saw it as the opportunity for a major enhancement of the 380Z's screen handling capabilities. So we added:

- an 8 x 10 dot matrix, to further refine the character set;
- an additional set of 128 user-definable characters;
- reverse video, underlining, and selective character dimming;
- smooth scrolling and faster screen filling;
- user defined windowing (and independent scrolling) of screen areas;
- audible tone generation (option)

And all that, we believe, makes the 380Z's screen handling the best on the market.

The Varitext option is available with new systems or as a user-installable enhancement to existing 380Z systems. Contact our Sales Office for details.
MAINTENANCE AND ENGINEERING SUPPORT NOW AVAILABLE FROM HEリストAR SYSTEMS

• REPLACEMENT PARTS
• CONTRACT MAINTENANCE
• REPAIRS AND SERVICING

Contact us for details today:

HELリストAR SYSTEMS LTD.
150 WESTON ROAD, ASTON CLINTON, AYLESBURY, BUCKS HP22 5EP. Telephone: 0296 630364
Telex: 837520 HELリストAR
**NEW BROOM FOR EPRoms**
TEX ERASER SWEEPS CLEAN!

**EPROMPT is Prompt Enough!**

Eproms need careful treatment to survive their expected lifetime. Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well-earned break. Cool, gentle and affordable; EPROMPT does it properly.

* 16-chip basic economy EPROMPT EB: £12 nett; £13 c. w. o. *
* 32-chip interlocked de-luxe EPROMPT GT: £40 nett; £49 c. w. o. *

Our EPROMPT needs just half-an-hour to finish its job; this is the proper erase time for all Eproms. While it's busy you may as well take a break yourself, but don't take too long without a timer on the job; over-erasing will be fatal.

Cool, gentle and affordable; EPROMPT does it properly.

Rushing it could burn their brains out. So cop-out of this helter-skelter world; take it easy the TEX way and give your chips a well-earned break.

**TEXTIME is Tea-Break Time!**

The only comprehensive teaching and reference book on all software aspects of Commodore's 2000, 3000, 4000 and 8000 series of microcomputers and peripherals.

- *NEW BROOM FOR EPROMS* *
- TEX/ME

**TEACH YOURSELF COMPUTING VIA THE BBC SERIES AND HAVE FUN!**

Introducing the TEXAS T199/4A home computer which plugs direct into any T.V. for full colour.


**Solid State Command Modules.**

- Two pioneering technological developments in particular set the T199/4A apart from the rest.
- Solid State Speech TTY — The optional speech synthesizer enables the T199/4A to literally speak-to you or anyone in your family. Actually reproduces the human voice electronically. Hundreds of words are available, and plug-in word modules will add hundreds more. TTI's exclusive technology lets you call up the words you want by simply typing them in. Outstanding voice clarity and fidelity. Solid State Speech is a proven technology already on the market in TTI's unique Speak and Spell TM electronic learning aid for children.
- Solid State Software TM Command Modules — Available in a wide range of application areas including many games, Chess, Blackjack/Poker, Pin Ball, Bingo, Attack From Outer Space etc. etc. Ideal learning aid for every member of your family— including pre-school children and fun too only —

**Texas Instruments**

- Two pioneering technological developments in particular set the T199/4A apart from the rest.
- Solid State Speech TTY — The optional speech synthesizer enables the T199/4A to literally speak-to you or anyone in your family. Actually reproduces the human voice electronically. Hundreds of words are available, and plug-in word modules will add hundreds more. TTI's exclusive technology lets you call up the words you want by simply typing them in. Outstanding voice clarity and fidelity. Solid State Speech is a proven technology already on the market in TTI's unique Speak and Spell TM electronic learning aid for children.
- Solid State Software TM Command Modules — Available in a wide range of application areas including many games, Chess, Blackjack/Poker, Pin Ball, Bingo, Attack From Outer Space etc. etc.

**Teaching Aids for Young Children etc. etc.** They let you use the TI Home Computer immediately, with no programming.

**Serious programmers will appreciate the time and effort saved by these pre-programmed modules.** Plus, they'll let you introduce your family to the computer in the easiest possible way. Solid State Software was pioneered by TI for use with its powerful programmable calculators.

**If you know computers you'll quickly see the difference in the T199/4A.**

**Texas Instruments has taken these features you've been wanting plus some you may not have heard about yet— and included them in one incredible, affordable computer system.** The T199/4A gives you an unmatched combination of features and capabilities, including:

- Powerful TI - BASIC — Built in 13-digs, floating point BASIC. Fully compatible with ANSI Minimal BASIC, but with special features and extensions for colour, sound and graphics.
- Up to 72k total memory capacity — 16K RAM (Random Access Memory) (Expandable to 48K). 26K ROM (Read Only Memory) plus up to 30K ROM in TI's Solid State Software Command Modules.
- 28K ROM — Operating system, BASIC, floating point, sound and colour graphics software are contained in ROM.
- 16-colour graphics capability — Easy-to-access, high resolution graphics have special features that let you define your own characters, create animated displays, charts, graphs and more.
- Music and Sound effects — Provides outstanding audio capability. Build three-note chords and adjust frequency, duration and volume quickly and simply. You can build notes with short, straightforward commands. Five octaves from 110 Hz (Hertz) to beyond 40,000 Hz.
- Built-in equation calculator — Unique convenience feature helps you find quick solutions to every day maths problems, as well as complex scientific calculations. Directly accessible from the keyboard.

**Ideal learning aid for every member of your family — including pre-school children and fun too only —**

**FOR MAIL ORDER DELIVERY OR FURTHER INFORMATION TEL: 01-455 9823 £287.50**

**MOUNTAINDENE 22 Cowper Street London EC2**
**PACKAGES**

<table>
<thead>
<tr>
<th>Machine</th>
<th>Application</th>
<th>Price</th>
<th>Code</th>
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<td>General ledger/ROM</td>
<td>£425</td>
<td>T1</td>
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<td>Revolving</td>
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<td>Purchase ledger</td>
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<td></td>
<td>Sales ledger</td>
<td>£375</td>
<td>T1</td>
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<td>Stock control/record</td>
<td>£200</td>
<td>T1</td>
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<td>Verstor</td>
<td>General ledger/ROM</td>
<td>£600</td>
<td>C5</td>
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<td></td>
<td>Integrated accs</td>
<td>£800</td>
<td>C5</td>
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<td>Purchase ledger</td>
<td>£400</td>
<td>C5</td>
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<tr>
<td></td>
<td>Sales ledger</td>
<td>£400</td>
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<tr>
<td></td>
<td>Word processing</td>
<td>£40</td>
<td>C5</td>
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</table>

**Machine Application** | **Price** | **Code**
--- | --- | ---
8000 Series | Database management/Information retrieval | POR | C1 |
         | Integrated accs | £250 | C1 |
         | Payroll | £250 | C1 |
         | Purchase ledger | £250 | C1 |
         | Sales ledger | £250 | C1 |
         | Word processing | £250 | C1 |

**Machine Application** | **Price** | **Code**
--- | --- | ---
880/880 | General ledger/ROM | £275 | G3 |
         | Integrated accs | £275 | G3 |
         | Integrated accs | £275 | G3 |
         | Integrated accs | £275 | G3 |
         | Integrated accs | £275 | G3 |

**TRANSACTION FILE**

We know when we're beaten! The volume of readers using Transaction File is escalating beyond our resources to cope. Regrettably, therefore, we are increasing the flat fee to £2.50 per advertisement. Each ad must be printed on the form below, using a maximum of 30 words.

We cannot accept Transaction File ads unless they are sent to us on this form. (If you don't want to damage your copy of PCW by cutting out the form then please use a photo-copy.) All ads must be accompanied by a cheque or PO for £2.50 made payable to Sportscene Publishers (PCW) Ltd. Ads are accepted only from non-commercial readers. We cannot repeat an ad unless a new ad is sent in, nor can we guarantee to place an ad in a particular issue. Ads are printed on a strict 'first-come-first-published' rota basis. Please mark your envelope very clearly: Transaction File (PCW)

14 Rathbone Place, London W1P 1DE. Thank you for your co-operation.

**Transaction File advertisement form**

All Transaction File ads must be submitted by readers on this form or a photo-copy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by flat fee of £2.50. Make cheques or POs payable to Sportscene Publishers (PCW) Ltd. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send form to: Transaction File (PCW), 14 Rathbone Place, London W1P 1DE.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.
TRANSACTION FILE

Got a micro and need it in action today? visit 123 PCW, Richmond, Nth Yorks.

ZX81, leads, manual etc.

Craft 128, RAM, manual etc.

IBM 4008, large keyboard, cassette deck, manual, many other m/c routines in ROM, over 100伟大的 peripheral, excellent.

Acorn Atom... 12k RAM, cassette deck, power supply, etc.

PET 2001, 8k new ROM, green screen, sound, basic, small keyboard, 50 programs, manuals and books £450. Also Texas Instruments TI-57 programmable calculator and monitor £220. Visit Bahrain. - Haltins (0424) 752736.

Texas TI58, 48 step programmable calculator with 22 manuals etc. Matrix, statistical programmed functions. Ext. cond. hardly used. £350 ono.


Acorn Atom: 9k RAM, 8k ROM, £35.40. S/ware, manuals, etc. £50 ono.


Nascom 1, 32k expansion, NASOC, £350. For NASOC board, Cottis Blandford tape printer and software inc. many s/w and documentation. £20. Tel: (0252) 392554.

ZX81... 16K Ram (expansion complete with 8K instruction store), S/ware inc. built in GC, £100 ono. Phone Free STD 0305 516355 for more.

Pet MZ80K... 48k with Xtal Basic, Knight commander, service manual, many tapes, perfect condition. Original packing £130 ono. Ring Bournemouth, se Varden 6746.

ICS... spare parts, course kits, software, hardware and real-time interfacing, manufacturers representatives. Tel: Carriquef 63207 eve.

TRS-80, 332 with 1 case green screen, VDU, expansion interface, disk drive, manuals, blanks disk, printer, hard disk £1000. Offers considered. Telef 01-623 7100 ext 389.

PET 32K new ROM with added green screen and 3 addi- tional memory boards (toolkit, superchip and Pickchip) worth additional £300. Rest of kit £1000. Tel: 01-958 5252.

PET 32K new ROM with added green screen and 3 addi- tional memory boards (toolkit, superchip and Pickchip) worth additional £300. Rest of kit £1000. Tel: 01-958 5252.

TRS-80, 48k, 2 disk drives, printer, hard disk. Extensions bench £3000. Various peripherals, all £100 to £500. Tel: (0273) 2451.

Acorn Atom... 9k RAM, 8k ROM, Cassette deck, power supply, etc.

Acorn Atom... 12k, (new complete) £200, or offer. Phone Kevin Palmer 01-440 1049 - Barenton.

Acorn Atom... 12k, (new complete) £200, or offer. Phone Kevin Palmer 01-440 1049 - Barenton.

Trackman... 32k RAM with 1/case green screen, £450, new. Microcomputer... £200, or offer. Phone Kevin Palmer 01-440 1049 - Barenton.

Acorn Atom... 12k, (new complete) £200, or offer. Phone Kevin Palmer 01-440 1049 - Barenton.

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TRANSACTION FILE

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There is a great deal of interest in the ACC, on 'The Ins and Outs of Interfacing'. The annual subscription is £8; this includes ACC membership (I'll give details of this scheme next month) and the secretary is Tim Fowler, 12 Charles Street, Oxford OX4 3AU.

As a follow-up to my article on starting a bulletin board in your details. Peter Whittle runs the ACC data access, his address is 49 Bartleman Road, Oxford OX4 1XL. Peter is also starting an amateur radio special interest group of the ACC. His call-sign is G4BBU. Two new clubs have come to our attention this month. In Altrincham, ACE (Altrincham Computer Enthusiasts) has just started up; the secretary is Martin Hicken, 189 Barrington Road, Altrincham, Cheshire WA14 1HZ. In Oxford, we have OPeCC (Oxford Personal Computer Club). The constitution is available; one which has had three very successful meetings so far, including one addressed by David Annal, the secretary, of the ACC, on 'The Ins and Outs of Interfacing'. The annual subscription is £8; this includes ACC membership (I'll give details of this scheme next month) and the secretary is Tim Fowler, 12 Charles Street, Oxford OX4 3AU.

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**USER GROUPS INDEX**

Here's an update of changes and new clubs. Full listing in July.

**TOWNS**

RAF Coltishall Computer Club meets at the Motor Club Social Centre, Coltishall, Nr Norwich, Norfolk on 1st & 3rd Thursdays monthly at 7.30. Contact: Chf Tech Dru. 21, River Close, R.A.F. Coltishall, Nr Norwich, Norfolk.

The SOBAT Computer Club (Leighton), Membership free for 1st two months and thereafter £15.00 pa, Inq Newsletter, software exchange. Contact: Mr T Rayani, 12 Calderon Rd, London E11 4EU. Tel: 01-556 5425.

Southampton Amateur Computer Club meets at 7.30 2nd Wednesdays monthly at the Medical Sciences Building, Bassett Crescent East, Southampton. Membership £5.00 pa (£3.50 students & OAPs) inc newsletter. Newly formed Junior section (with own regular meetings). Contact: Paul Blunt, Gardenways, Chisworth Tower, Chisworth, Southampton. Tel: 0703 766161.

Forum-80 Hull... (Forum-80 Users Group) Tel: 0422 858169. System operator. Frederick Brown, International electronic mail library. For up down loading software. Forum-80 Users Group, Pet Users section. Shoping list system hours. 7 days a week midnight to midnight. Mon 7.00pm to 11.00pm Tue/Sat 11.00am to 7.00pm. Forum-80 Hull... (TRS-80 Club) Tel: 01 313 512533. Facilities: electronic mail, program downloading, shopping list. Hours: Mon 1800-0700 Sat 0700-0700.


**NETWORK NEWS**

These are all the European networks of which we're aware. Most are free but phone them for details.

**CTUK! CENTRES**

Ray Skinner, 66 Clapham Avenue, Bellingham, Cleveland, TS23 LLN
David Tebbutt, 7 Colling Drive, Eastcote, Middx HA4 9EL
Vernon Gifford, 111 Selhurst Road, Croydon, London SE25 5LH
John Stephen Bone, 2 Claremont Place, Galashiels, Tyne & Wear NE8 1TL
Mike Baker, 5 Edinburgh Road, Hanwell, London W7 3JY
Vernon Quaintance, 50 Beaverton Avenue, Norbury, London SW16 4UN
R L Saunders, 14 St Nicholas Mount, Hemel Hempstead, Herts.
Brian Taylor, Tonbridge Area Library, Avory Avenue, Tonbridge, Kent
Robin Bradbeer, Polytechnic of North London, Holloway Road, London N7
Steve Haynes, 5 Guinea Street, Gloucester GL1 3LL
Ted Broadhead, 22 Cardinal Road, Leeds LS11 8KY
Andrew Holey, 30 Masons Field, Manning Heath, Horsham, Sussex RH13 4JP
Brigitte Gorton, 16 Furtbright Crescent, New Addington, Crowdon CR0 0HT
Susan Kelly, Head of Reference Services, PO Box 4, Rotherbury Centre, Harrow, Middlesex.
Philip Jey, 130 Rush Green Road, Romford, Essex.
Richard Powell, 22 Downham Court, South Shields, Tyne & Wear
Derrick Daines, 18 Connaught Avenue, Sutton in Ashfield, Notts.
Keith Taylor, Carter Hydraulic Works, Thurnbury, Bedford BD3 8HG
Roger Shears, 18 Woodmill Lane, Bitterne Park, Southampton SO5 4PY
J M A Kilburn, Headmaster, Shawfield North, Shawfield North, Norden, Rochdale, OL12 7QR
Bill Gibbons, 3 Longholm Road, Retford, Notts DN22 6TU
Alan Northcott, Rishmoor, Worcestershire. Tel: 010-468 23660, 700.
Alun Sutcliffe, 4 Binfield Road, Wokingham, Berks RG11 5ET
Tony Cartmell, 54 Foregate Street, Worcester WR1 1DX
Tom Graves, 15a West End, Street, Somerset BA16 6LO
Alan S Waring, 50 Drayton Gardens, Winchester, Hampshire. Tel: 010-468 23660, 700.

**DIARY DATA**

Readers are strongly advised to check details with exhibition organisers before making travel arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

**West Germany** (Hanover) Hanover Trade Fair, Contact: Deutsche Messen-und Ausstellungen 01 651 2191

**Brighton** (Town Hall) Business Equipment Exbn, Contact: Douglas Temple Design Bourne 29533.

**Brussels** Compex Europe, Contact: IPC Exbn Ltd 01-643 8040

**Wembley** (Conference Centre) Microcomputer Show Contact: Silver-Collins Ltd 01-729 0677

**Bristol** (Exbn Complex) Micro City Exbn, Contact: Tomorrow's World Exbn Ltd, Bristol 292156

**Aberdeen** Business & Industry Exbn, Contact: Silver-Collins Ltd, 01-729 0677

**Casino** Fax 702 User Group, Newsletter includes: Reviews, puzzles, programs, raffles etc. Membership £5.00 pa, Inq: Steve 0151 220 9733. Contact: R Cooper, 11 Baintree Rd, Dunmow, Essex.
Trader Computers Limited brings you the ADVANTAGE — an integrated desk-top computer with 64k RAM + 20k video RAM, & 2k boot PROM, 12" green screen, bit-mapped and/or graphics display, twin quad capacity 5¼" floppy disc drives (720k) and 15 programmable function keys. Complete with either CP/M or DOS/BASIC, business graphics, diagnostic and demonstration software and a technical manual, the Advantage costs only £2371.20 plus VAT.

Trader Computers Limited brings you a low-cost multi-user, multi-operating system Horizon for up to 5 users, each with over 50 kbytes of RAM and a choice of CP/M or DOS. Print spooling, file protection and passwords are provided. A two-user TSS/C system with a 5 Mbyte hard disc drive, complete with Software and documentation is only £4402.17 plus VAT.

DEALERS! TELEPHONE US NOW FOR UNBEATABLE TRADE PRICES.

Trader Computers Ltd 65 Loudoun Road London NW8 0DQ
Telephone 01-328 3484
Last month's puzzle — judging by the enormous response — was the easiest to date. Well over 300 entries poured in and, as usual, most of you took the trouble to tell us just how easy it was.

Well, there are many solutions to the problem, but the two most popular and smallest ones were 5039 and 7559. Each of these divides by ten to give a remainder of nine, by nine to give a remainder of eight, etc.

The winner, chosen at random, was Mr James Radley of Liverpool. Congratulations Mr Radley, your prize should have reached you by the time you read this.

For those readers who make use of London's main commuter stations, watch out for PCW's Commuter Computer Competition. You could win a Sinclair ZX81. Here's a free tip for those who may find the problem too difficult: take each station in turn from Notting Hill Gate and count how many different ways there are of getting to it from each previous node.

Quickie

No answers — no prizes. Two women sell 60lb of tomatoes in the market. The first woman sells half of them at 31b each, the other half at 21b for 50p, making £5 in all. The second sells the other half at 2lb for 50p, making £7.50, giving a total of £12.50 between them.

The following week they decide to sell their produce jointly and so they fix the price of the tomatoes at 5lb for £1. Once again they have 60lb to sell. However, when all the tomatoes have been sold they find they only have £12, and a quarrel ensues as to where the extra 50p went. Where did it go?

Prize puzzle

A number cruncher very solvable by micro — or any other method. We want you to find a six digit number which, when multiplied by an integer between 2 and 9 inclusive gives the original six digit number with its digits reversed.

Thus, if the original number is 123456 then 123456 x 8 should equal 654321. Of course, it doesn’t, but it is possible to find more than one solution to this problem, We’ll accept any as eligible for this month’s prize. Answers, on postcards only, to May Prize Puzzle, PCW 14, Rathbone Place, London W1P 1DE, to arrive not later than last post 31 May 1982.
MEMORY. Edited using the cursor controls. Adjust: allows the current frame to be handled of the frames. These are as follows:

Adjust: adjusts the current frame to be edited using the cursor controls.

Up/down/left/right: moves the current frame in the specified direction.

Clear: clears the frame on the screen.

Frame: recalls a specified frame.

New: creates a new frame.

Fetch/Dump: saves loads an animated sequence.

Speed: determines the speed of animation.

Animate: animates the sequence.

Fetch: retrieves a specified frame.

Save: saves the displayed frame in memory.

Frame: recalls a specified frame.

Mini-Animate will enable users of 'new ROM' PETs to produce animated graphic sequences of a good length. Instructions are not included in the program to save memory space. What the program actually does is to allow frames to be displayed in rapid sequence on the screen, thereby giving an animated effect. The author has included comprehensive editing facilities to allow easy handling of the frames. These are as follows:

Speed: determines the speed of animation. Animates the sequence. Fetch/Dump: saves loads an animated sequence. New: 'NEWs' the sequence.

The sequenced graphics character should not be used in any of the frames as it is used as a control character. Control mode is activated by hitting 'return' which also used to exit the Adjust mode. The control mode is advanced by pressing the space bar.

It is advisable to save the two programs in succession as the first automatically loads the second and also sets the memory pointers for it. Mini-Animate will need to be adjusted for 'old ROM' PETs by changing the POKE command to save memory.

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PET Mini-animate
by M Whitworth

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CASSETTE ONE

"I'm sure you'll be pleased...I was delighted with your first cassette." - F. Buchheit, London NW1

"I have been intending to write today that you supplied me with earlier this month. Please send you a £1.50 refund."

Michael Orwin, 26 Brownlow Rd, Willesden, London NW10 9QL.

From: S. H. London SW4

CASSETTE ONE SIDE ONE UK

MACRO SYSTEMS CORD.

Read, Invisibles, Planet aliens, Maze of death, Planet landing, Bung splat, Bouncing letters.

CASSETTE ONE SIDE TWO

BASIC PROGRAMS

CHELLING, Mastermind, Basic hangman, Robots, Death, Planet lander, Bug splat, Bouncing letters.

CASSETTE TWO

JUST OUT, TEN 16K BASIC GAMES.

CASSETTE ONE SIDE ONE 1K

ItsYsTEms Ltd DISKETTE DRIVE HEAD CLEANING KIT

178 PCW

S/S - S/SECTOR (77 TR CERT)

D/S - S/SECTOR (40 TR CERT)

VERTATIM

D/S - DENSITY S/SECTOR

S/S - S/SECTOR

MEMOREX

Vic 20, Micron, 2X80181, PET, TRS80, MZ80K, APPLE

BUILT TESTED A GUARANTEED COMPUTER FOR ANY INPUT

THE BEST

34 CANNONBURY AVENUE, PINNER, MIDDX, HA5 ITS

Part 2:

100 INPUT "FILE SIZE": V,H: IFV020=90 THEN 100


200 FOR K=1 TO 16: POKE K, K: NEXT

300 FOR K=1 TO 16: POKE K, K: NEXT

M-280K Catch.

by W&T Thomas

While Catch is not necessarily addictive, it is certainly enjoyable. The aim of the game is to catch a tennis maniac on a stretcher (held by two figures which you control) as they hurl themselves out of a four-storey building. The more men you catch the more points you get, and ten men jump from each floor. The program uses about 12k of memory. It is well thought out and planned and much attention is paid to those little details which can make a game as much fun to watch as to play. Disk system owners will have to change the machine code routine in lines 10-11. Full instructions are included in the game.

S.H SOFTWARE

SCRAMBLE/Excellent version of the popular arcade game.

Writeen in machine code.

ROAD RACERS/Down the roadscars but don't crash. Graphics. Written in machine code.

OBSIDIAN/Grafting/Sound. Written in BASIC SP-3335

PLAYGROUND/Excellent Bright Graphics/Sound. Written in machine code and BASIC SP-3335.

Othello - An excellent opponent. Written in BASIC SP-3335.

PHOTOGRAPHS ROMS - Gives joined up pixels and B & W graphics.

GRAPHICS ROMS - Design your own. Send 140 for a character design on graph paper. State if you want to use your design or not. Full listing instructions included.

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178 PCW

M280K

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(1) Computer to 5 Pin DIN

(2) Computer to two 35mm plugs and one 25mm plug (most common).

(3) Computer to three 35mm plugs. £4.50 each (State 11, 12 or 3). Later send us your incompleat lead (supplied with the machine) and we will send you a £1.50 refund.

ELECTRONICS APPLIED, 4, DROMORE ROAD, CARRICKFERGUS, Co. ANTRIM BT38 7PQ

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All prices fully inclusive.

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Great products from Mutek

Tiny PILOT

Mutek's Tiny PILOT (MTP) is a small-scale yet comprehensive implementation of the PILOT text-oriented programming language for OSI and UK101 computers.

Commands are:
R: remark; T: type text (or graphics character); : accept name; A: accept answer (numeric or alphanumeric); M: match (full range of comparisons); J: jump to label; U: use subroutine at label; E: end subroutine; C: compute (2b single-character variables); I: input numeric value to variable; P: produce numeric value to variable; S: stop (end program)

Numeric functions are performed in 16-bit unsigned form, giving a range 0-65535. A full line-editor is included in the package.

Note: MTP uses CEGMON facilities extensively and will not operate with non-standard monitors such as WEMON or MONUK02. MTP is available as a package with the relevant version of CEGMON at a special reduced price. This gives you the special facilities of CEGMON as well as the best use of MTP.

The EPROM package is available ex-stock, and comes complete with fitting instructions, manual and reference card.

PILOT package £17.50+VAT
PILOT/CEGMON package £29.50+VAT

StarLink

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A complete comms. package for OSI systems, including:
'Smart terminal' mode for link to external mainframe computer, disk or ROM BASIC; full editing; and many other features.

Available in EPROM in two versions: Starlink 1 for disk or ROM BASIC systems, and StarLink II for non-disk operation of Superboard Series II. Specify type required when ordering!

Starlink (either version) £17.50+VAT

Coming shortly

Modern tacoustic coupler! for use with Starlink — c.£50 or less

High res (256x256) graphics for Superboard/C1 — bare board + instructions, software c.£35, ready-built £610

FipFor (full Forth Interest Group implementation) in ROM — c.£50, source listing c.£15

MUTEK

Quarry Hill, Box, Wilt
Tel: Bath (0225) 743289
Apple 3D Maze.

by Malcolm Banthorpe

Over the past month or so I have become almost addicted to this game. The object is to navigate your way from entrance to exit of a maze which the computer draws (as a plan view) when the game starts. This is done using the commands Forward (one to nine steps), Left or Right. As soon as it has finished drawing the maze the computer puts you theoretically at the entrance to it, giving you a 3D perspective view of the tunnel ahead. You are told which direction you are facing each time you move and if you leave too much time between moves the computer will ask you to hurry and remind you of the commands.

It is perfectly possible to get completely lost in the maze and provision has been made for this. You are allowed three 'Help calls' which show your position on the plan view for as long as you need to work out where you are, and three 'Jumps' which transport you to a remote location so you can get even more lost. As the maze is drawn at random it is different every time so the variations are endless.

3D Maze will run on an ITT2020 with Palsoft in ROM, if a single state is changed as per line 11, or on an Apple II Plus.
SPACE INVADERS on m/c. Includes mystery ships, TRS-80 L2/GENIE SOFTWARE D6K).

Part of MACHINE CODE WRITER enables you to copy any

APOLLO: Save 300 people crash landed on the

a top 10 ladder, continuous display of Score, High

rate of change of acceleration.

RATE Control a spacecraft given control only of its

TRI = T + 1:

FOR D = 2 THEN FOR H = X TO Y - L STEP -1:COLOR=5:

15: PRINT H,Y: GOSUB 6000: COLOR=5 THEN V = V -

= XT:Y = VT 5 THEN X = X + 1:

GOTO 470

420 C = C + 1: IF C = S THEN 4

470 GOTO 470

430 X = X + 1: IF SCRN (X,Y) = 1 THEN X = X - 1: GOSUB 8000

440 GOTO 470

450 C = C + 1: IF C = S THEN 4

470 GOTO 470

460 X = X - 1: IF SCRN (X,Y) = 1 THEN X = X + 1: GOSUB 8000

480 C = C + 1: IF C = S THEN 4

470 GOTO 470

490 B = B + 1: IF B > VI THEN 240

520 Y = Y + 1: IF Y > V THEN 155

525 GOTO 240

530 RESTORE

540 READ B

550 A = B: READ B: IF B > VI THEN 250

560 GOSUB 9000

570 C = / A / B + 2 / 2 = B

580 IF SCRN (X - 1,Y) = 0 THEN

600 IF D = 3 THEN 155

615 X = FN A(19) + Y = 38

630 JU = JU * AS + 50:

635 JU = JU + 5:

640 PRINT "YOU ARE FACING":

650 PRINT "YOU'VE ALREADY HAD THREE

660 PRINT "CHRS (7); CHRS

670 ORDER BOTH CASSETTES FOR

680 IN GET HELP BY"305 JU = JU .

690 N GET HELP BY"305 JU = JU .

700 PRINT "OR YOU CAN TAKE

710 PRINT "WITH YOUR POSITION IND

720 PRINT "THE COMMANDS ARE

730 PRINT "NOW MANY STEPS (1-V)"

740 PRINT "YOU CAN TAKE

750 PRINT "WITH YOUR POSITION IND

760 PRINT "OR YOU CAN TAKE

770 PRINT "NOW MANY STEPS (1-V)"

780 PRINT "YOU CAN TAKE

790 PRINT "WITH YOUR POSITION IND

800 PRINT "OR YOU CAN TAKE

810 PRINT "NOW MANY STEPS (1-V)"

820 PRINT "YOU CAN TAKE

830 PRINT "WITH YOUR POSITION IND

840 PRINT "OR YOU CAN TAKE

850 PRINT "NOW MANY STEPS (1-V)"

860 PRINT "YOU CAN TAKE

870 PRINT "WITH YOUR POSITION IND

880 PRINT "OR YOU CAN TAKE
Atari Sums For Kids.
by Derek Lee

At last I have managed to procure a program for the Atari 400/800! This one goes a little further than a lot of maths programs for infants in that it teaches addition as well as subtraction on a simple level — and should keep any child amused at the same time.

Two random numbers are generated which, when added or subtracted, give an answer between zero and nine. A correct answer will move two spaceships towards each other until they collide and explode. A wrong answer will yield different noises and colours, drive the answer to be displayed prior to the next...

PROGRAMS

805 TEXT : HOME
810 PRINT "CONGRATULATIONS YOU A
RE WITHIN EIGHT"
815 PRINT "PRINT "THE EXIT"
820 PRINT : PRINT
825 PRINT "PLAY AGAIN (Y/N) ?";
830 BET 44
835 IF AN = -Y; THEN 100
840 END
1000 CALL 7:AB:PIKE 493520,15ULCON
3: HOLP D,0 TO HI,1; HOLP V,0 TO HI,0
1010 HOLP V,0 TO HI,0; HOLP D,0 TO HI,1
1020 RETURN
1100 HOLCON:0: HOLP A,B,C,D TO 0,1
1110 HOLP A,V1 TO C TO B,V1 - D
1120 HOLP A,V1 TO D TO A,V1 - C
1130 HOLCON:0: HOLP E,F TO A,V
1140 HOLP A,B,D TO V1 - D
1150 HOLP A,B,V1 - D TO A,V1 - B
1160 RETURN
1200 A = HI - A; B = HI - B
1205 HOLCON:0: HOLP B,D TO A,1
1210 HOLP B,D TO A TO D,1
1220 HOLCON:0: HOLP A,E TO A,V
1230 RETURN
1300 HOLCON:0: HOLP E,F TO Z
1310 HOLCON:0: HOLP H,I TO E,F / 2
1320 RETURN
5000 FOR T = 0 TO 100; NEXT: GOSUB 6900
6000 RETURN
4600 FOR 60 TO 1 TO 3:2: PRINT " ";
"1635A1: NEXT RETURN
6500 FOR N = 250 TO 5 STEP -10
FOKE 615; HI = 49238 + P
01: CALL 1000: NEXT RETURN
8000 FLUSH: PRINT "ONLY "C - 1" STEPS WERE POSSIBLE":
NORMAL 7: RETURN
8100 PRINT "DIRECTION"
9000 NORMAL: RETURN
9900 HOLCON:0: HOLP D,V1 - E / 2 - B:
2: RETURN
1000 DATA 2,11,32,62,14,110,117,
22,130,136,144,148,152,1
54,156,158,160
1010 DATA 122,4,122,141,149,192,
160,35,140,15,1,15,0,45,322,
206,250,200,192,64,208,242,
145,19,146,40
1020 DATA 160,1,142,0,138,24,23,
5,1,206,250,141,149,192,232,2
24,1,208,252,142,135,208,237,7
RETURN

Atari Sum Games are generated which, when added or subtracted, give an answer between zero and nine. A correct answer will move two spaceships towards each other until they collide and explode. A wrong answer will yield different noises and colours, drive the answer to be displayed prior to the next...

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try. Five correct answers will give a noisy response of 'great stuff!'!

An effective amendment to this program is to replace the appropriate lines with the ones given below. This makes use of the audio track of the Atari 410 recorder. Immediately after CLOAD the program, take the tape out of the recorder without rewinding and put it into an ordinary recorder. Prepare a list of such comments as 'well done', these must be five seconds long. Then put the recorder into record mode with the tape control engaged and, when you are ready, use a stop-watch to time yourself recording the remarks. Finally, rewind the tape and reload the program. It is a good idea to use the child's name, thus adding a personal touch to the congratulations given by the computer. Synchronisation may need practice and line 3001 may need adjustment. Sums for kids needs 5k to run.

### Amendment:

- Amendment: "done!' - these must be five seconds 5k to run.
- and out of the recorder without rewinding
- CLOADing the program, take the tape
- noisy response of 'great stuff!'.'
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The HR-80 board for the 8032 is now available at the same low price £149.00 plus VAT.

Useful applications for the ZX81 seem to be cropping up more and more in the programs mailbag. This one needs 16k and enables you to make an alphabetical index of book titles and their authors - although it could be used for indexing anything from the rest of your software to your record collection. Naturally you need a cassette recorder (unless you plan on leaving your ZX81 switched on 24 hours a day!) and a printer helps but is not necessary.

30 CLS
40 CLEAR
60 POKE 161510,0
70 PRINT "TITLE"
80 PRINT "ENTER"
90 PRINT "ENTER TITLE"
100 INPUT A$
110 CLS
120 PRINT "ENTER "
130 INPUT B$
140 CLS
150 PRINT "ENTER AN ESTIMATE" OF ENTRY . "
200 INPUT C$
210 CLS
220 IF I=N-1 THEN GOTO 510
230 LET L$(J+1)=T$
240 LET L$(J)=1,$(J+1)
250 IF CODE L$(J)<=L$(J+1) THEN
260 FOR K=1 TO N-1
270 LET L$(K+1)=L$(K)
280 LET L$(1)=L$(1)+1
290 IF CODE L$(1)<28 OR CODE L$(1)>37 THEN PRINT AT 18,5:"ERROR"
300 INPUT L$(1)
310 IF LEN L$(1)>M THEN GOTO 470
320 LET N=I
330 IF CODE L$(1)="1" THEN GOTO 70
340 FOR W=0 TO 60:NEXT W:POSITION 4,10:? #6;"ENTER "
350 FOR L=0 TO 5:SOUND 0,200-L*30,10,10
360 NEXT L
370 NEXT F
400 LET X$="ENTER TITLE"
410 LET Y$="ENTER "
420 LET Z$="ENTER AN ESTIMATE" OF ENTRY . "
430 LET A$="TITLE"
440 LET B$="ENTER"
450 LET C$="ENTER TITLE"
460 LET D$="ENTER"
470 PRINT AT 15,0;"NB-RE
480 GENEROUS AS YOU CANNOT
490 ENTER THE NUMBER LATER ON."+
500 PRINT AT 15,0;
510 GOTO 580
520 PAUSE 100
530 CLS
540 goto 510

330 INPUT X$
340 IF LEN X$>M THEN PRINT "ABBREVIATE ENTRY"
350 FOR F=1 TO M
360 PRINT AT 4,5:X$:AT 5,4:"F - "+F;
370 NEXT F
380 IF LEN X$>M THEN GOTO 330
390 LET L$(1)=" (TO M)"+X$
400 LET X$=" "
410 IF CODE L$(1)=227 THEN LET N=I
420 IF CODE L$(1)=227 THEN LET M=I
430 CLS
440 PRINT "ENTRY",";TAB 12;
450 LET L$(1)=0 TO M
460 IF CODE L$(1)=0 TO M+1 THEN GOTO 530
470 ORDER
480 NEXT I
490 NEXT I
500 REM ORDER
510 LET L$(1)=L$(1) TO M+1
520 IF D<M*N THEN GOTO 170
530 IF D<M*N THEN GOTO 250
540 IF PRINT "GET READY"
550 FOR W=0 TO 60:NEXT W:POSITION 4,10:? #6;"ENTER "
560 FOR L=0 TO 5:SOUND 0,200-L*30,10,10
570 NEXT L
580 NEXT L

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ZX81 Book Index

by Ian Andrews

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184 PCW
PET Stockmarket.

by Bob Chappell

A game on a slightly more serious note than usual. Stockmarket needs a quick brain and a good memory. It runs in just under 8k on both 'old' and 'new' ROM PETs. Full instructions are included in the game.

- IF G$="A" THEN GOTO 30
- IF G$="B" THEN GOTO 70
- IF G$="C" THEN GOTO 130
- IF G$="D" THEN GOTO 30
- IF G$="E" THEN GOTO 50
- IF G$="F" THEN GOTO 70
- IF G$="G" THEN GOTO 90
- IF G$="H" THEN GOTO 110
- IF G$="I" THEN GOTO 130
- IF G$="J" THEN GOTO 150
- IF G$="K" THEN GOTO 170
- IF G$="L" THEN GOTO 190
- IF G$="M" THEN GOTO 210
- IF G$="N" THEN GOTO 230
- IF G$="O" THEN GOTO 250
- IF G$="P" THEN GOTO 270
- IF G$="Q" THEN GOTO 290
- IF G$="R" THEN GOTO 310
- IF G$="S" THEN GOTO 330
- IF G$="T" THEN GOTO 350
- IF G$="U" THEN GOTO 370
- IF G$="V" THEN GOTO 390
- IF G$="W" THEN GOTO 410
- IF G$="X" THEN GOTO 430
- IF G$="Y" THEN GOTO 450
- IF G$="Z" THEN GOTO 470
- IF G$="a" THEN GOTO 10
- IF G$="b" THEN GOTO 30
- IF G$="c" THEN GOTO 50
- IF G$="d" THEN GOTO 70
- IF G$="e" THEN GOTO 90
- IF G$="f" THEN GOTO 110
- IF G$="g" THEN GOTO 130
- IF G$="h" THEN GOTO 150
- IF G$="i" THEN GOTO 170
- IF G$="j" THEN GOTO 190
- IF G$="k" THEN GOTO 210
- IF G$="l" THEN GOTO 230
- IF G$="m" THEN GOTO 250
- IF G$="n" THEN GOTO 270
- IF G$="o" THEN GOTO 290
- IF G$="p" THEN GOTO 310
- IF G$="q" THEN GOTO 330
- IF G$="r" THEN GOTO 350
- IF G$="s" THEN GOTO 370
- IF G$="t" THEN GOTO 390
- IF G$="u" THEN GOTO 410
- IF G$="v" THEN GOTO 430
- IF G$="w" THEN GOTO 450
- IF G$="x" THEN GOTO 470
- IF G$="y" THEN GOTO 490
- IF G$="z" THEN GOTO 510

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188 PCW
Anyone who has used Basic for any length of time will know that it is not possible to have a program print an inverted comma on the screen using the normal PRINT statement.

This easily adaptable program runs on the MZ-80K. Lines 100–140 are the program itself and lines 200–220 are for demonstration. They result in a display of TYPE "ENTER" on the screen. Lines 100–140 must be run before a USR call is made. The decimal start address is arbitrary and could be anywhere suitable in memory.

100 FOR N=1 TO 6
110 READ A
120 POKE 24062+N,A
130 NEXT N
140 DATA 62,34,205,18,00,201
200 PRINT"TYPE ":USR(24063)
220 PRINT"ENTER":USR(24063)

UK101 Crossword Notepad.
by John Rawcliffe

If there are any crossword fans reading this issue they will be interested in this program. It allows you to use the VDU as a notebook to help compile or solve crosswords of up to 16 characters (a grid is presented and the user fills in the blocks and eventually characters). The number keys one to four move a cursor about the grid and you can insert or delete where required.

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cats. Enter Date, Narrative and Gross Value of each Cash Tournament. Classified into 20 Sub-
cats. Enter Date, Narrative and Gross Value of each Cash Tournament. Classified into 20 Sub-
cat.
Although this is a fairly simple program, the graphics are good and so is the idea. As it only uses 2.5k, owners of machines with bigger memories should be able to add other facilities (maybe there’s a genius somewhere who could write a program which made their computer able to display clues as well!), although I’m stuck for useful suggestions. Superboard users will have to

modify the display routines.

Finally, there is just one little disadvantage. The squares cannot be numbered as a whole square and would mean you couldn’t fit a character in. Still, it should prove more than useful for crossword fanatics who just can’t get it right first time!
through until the display contains only P0 and then press the following sequence: INV MODE FST GOTO0 P0 BST LBLO. Now save this on tape; it is your 'skeleton' program.

To produce the program we want, go back into Write Mode P0 and hit BST; you should see "A" LBLO in the display. Backstep four times and you will see a pair of quotation marks the wrong way round go past; the display you end up with is:

```
" \" \\
```

It is between those quotation marks that our program will sit. Looking up the special symbols we need we find that $x = \sqrt{AR01 +/- AR02} \%$ translates into $M+16 \cos M+12 \text{Min01} M+13 \text{Min02} \cos^{-1}$ and so enter this now.

Here comes the magic bit; pressing FST repeatedly takes you past the end of the program and back to the beginning, but the second time through you will see the translated version "$x = \sqrt{AR01 +/- AR02} \%$!"

If you keep going you can cycle endlessly seeing alternately the alpha and the instruction versions of the program. Run the program and it executes as normal, inserting the contents of M01 and M02 in the appropriate slots eg:

$x = \sqrt{2.45 +/- 8\%}$

This can be used as an output subroutine to a main program: you can indeed enter the main program into P0 before Step 000 where the dots begin, to avoid using an extra register.

I think that this should provide sufficient food for thought and experiment for a while but I will let you in on the fact that Andrew McLeod's method leads on to a new way of displaying the whole of program memory (like an obscurely encoded hex dump) which allows you to crack password protected programs. That will be the subject of a future corner; there isn't space here to explain. Next month Calculator Corner will be a special double-sized edition in which I shall Benchmark Sharp's remarkable new pocket computer, the PC1500. To preserve that good feeling, I should call it Not Calculator Corner.

Not a Bludner, actually, but quite deliberate. If you tried to ring a company called 'Wild Bill's Computer Rodeo' which advertised in last month's Rodeo which advertised in last month's calculator corner, you could quite justifiably call it Not Calculator Corner.

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ACCESS will ideally run on 2 drives. However, it will support a single drive system and a version is available for the SyMMible 5 megabyte hard drive.

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Coming up very soon, a new Sharp micro. Called the "MZ-90A", it seems likely to replace the ageing MZ-80K, for it has a very similar spec — so our spy tells us — but with the high-res graphics from the '80B, a better keyboard and a 4 MHz Z80 in place of the '80K's 2MHz.

Still in the rumours department, we hear from one of our usually unreliable sources that the latest Apple IIs have a modified main circuit board — Revision S — which has been redesigned to reduce RF emission. Unfortunately this has affected the timing signals along the bus where you plug in your add-on board, with the result that over half the add-on boards now being marketed don't work. How touchy to see the publisher of "a certain other micro magazine" continue his doomed campaign to inform advertisers that their rag is "widely regarded as Britain's most successful microcomputer magazine", even though the mag in question now sells 16,000 odd copies fewer than PCW in the UK. Is this "honest, decent, or truthful", the Advertising Standards Authority might ask?... Actually that rag seems to have an odd effect on some journalists — one of its minor contributors has taken to writing semi-coherent and wildly inaccurate letters to The New Scientist while a seniorwriting semi-coherent and wildly inaccurate letters to New Scientist while a senior

"...a modified main circuit board and a 4 MHz Z80 in— with the high-res graphics replacing the ageing MZ-80K, which together with the alphanumeric keyboard and integral cassette deck later this year, will bring out a largish portable unit, with a tape interface at last year's appearance at last year's..."

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Word processors are very much a product of the so-called ‘micro revolution’. In the bad old days it was totally unthinkable to use an entire computer for text processing - the machines were just too expensive for all but the most ‘serious’ of uses. Text editing programs have, of course, long been available on big computers but these were really designed for entering the source code of programs for later compilation.

Today, thanks to micros, computers are cheap and plentiful and it makes perfect sense to dedicate one to a specific task, such as text processing. In the last few years dozens of word processing (WP) systems have appeared on the market, most of them comprising a microcomputer system plus a WP program to run on it. At the top end of the market are the dedicated WP systems, microcomputers designed solely for WP and usually marketed by the office equipment manufacturers.

Once you’ve made up your mind that you need (or want) a WP system, deciding which one is most suitable for your requirements can be a bewildering experience. With several dozen permutations of packages and systems now available, it’s important to get a few things clear in your mind before you start looking. As with any other computer/packag e purchase, you’ve got to define your needs — existing and future. But before we get involved with that, let’s take a look at what word processors are and what they can—and cannot—do.

What is word processing?

If you wanted to be pedantic, you could say that word processing at its simplest is somebody writing on a piece of paper. However, we’re concerned here with the use of computers to input text, store it and to reproduce it onto paper only when you’re completely satisfied that it’s properly spelt and nicely formatted.

Because the text is stored in a computer’s memory, it is very easy to make changes to it. The facilities for doing this range from the very simple to some quite powerful capabilities. For example, when you’re reviewing your masterpiece, you may discover a typing mistake. By positioning the ‘cursor’ (the mark on the screen which shows you where you are in the text block) and typing in the correct spelling, the mistake is rectified within the memory. If you find you’ve omitted a word, or you want to delete something, you position the cursor appropriately and, using special commands, either insert or delete as desired.

More sophisticated commands, available in all but the simplest word processors, allow you to move entire blocks of text around or to insert blocks or delete them. Search and replace commands are also available; these would allow you to, for example, replace every occurrence of the letter ‘a’ in your text with a ‘b’ if you were so inclined with a single command line.

Finally, you can send the text to a printer and perform various formatting operations to give an aesthetically pleasing appearance to the text.

Word processors are very good for certain jobs such as the repetitive typing of standard form letters, producing long documents, reports which may need extensive revisions before they are ready for typing, or reproducing documents guarantees, for example which need a specific item included, such as a serial number, which differs with each copy. On the other hand, they have certain disadvantages: cost: and the time taken to learn to use them may make word processors impracticable for very low volume work.

If you produce just a very small volume of unique documents such as one or two short letters a day, then a typewriter is perfect for you. You’d find it quicker and easier to type a conventional typewriter as a full word processor system probably wouldn’t be cost-effective.

To decide which word processor is best for you — or whether you need one in the first place — you must look carefully at the use to which you propose to put it.

Types of user

We’ve identified four potential WP users with differing word processing requirements. Firstly there’s the author or journalist, who will be using a word processor to enter large volumes of text, each piece of which will be a unique, one-off document. On the hardware side, this user will need plenty of memory and a large disk capacity to cope with large volumes of text. Keyboard and screen considerations will be vital but the type of printer chosen may not be so important — a script or article which will be typeset doesn’t necessarily have to be an immaculate document and most such users will probably be satisfied with a dot matrix printer, especially as these are much faster than daisywheel units.

Software considerations will tend to focus on the editing end of the package — authors want extensive editing capabilities such as moving around blocks of text, inserting whole blocks mid-way through text, deleting blocks, substituting strings, etc. The command format should be easy to learn and to use, so as not to interfere with the thinking process and it helps here if as many as possible of the frequently used commands, such as insertion and deletion, are available as special function keys. For work on very lengthy documents like that best-selling novel, the speed at which the system can jump backwards and forwards through text, pulling sections off disk and writing back on as is the ability to centre headings and automatic blank lines for the later insertion of figures and the typed in header and sub-headings. Automatic blank lines for the later insertion of figures and the ability to do fancy things with the margins and, additionally, to use a daisy-wheel printer with proportional spacing, he’ll need a formatter which enables him to exploit all its facilities, particularly the insertion of spaces between characters in a word. This gives a much better effect when justifying than simply inserting extra blank spaces between words, as has to be done with a simpler printer. Given a good-quality
daisywheel printer with a carbon ribbon, it is possible to produce camera-ready copy for printing.

Next on our list of users is the manager. According to the theory, managers will soon be doing all their own word processing, leaving secretaries free to do other things. I don't see this happening for quite a while, but in Britain, we'll assume an 'office of the semi-future' situation in which the manager prepares rough drafts of his documents on a word processor and hands them over to the secretary for final formatting and printing. This means, of course, that either the two will have to share a system or that the two systems should be compatible, which is not to the exclusion of being able to read each other's disks.

The manager, then, will not require particularly extensive editing facilities other than the usual insertion and deletion features, perhaps with block move and deletion thrown in to make life easier. He wants to be able to type in his rough drafts in much the same way as a secretary currently types 'unformatted' documents to his secretary from rough notes. This allows the secretary to get on with other work instead of sitting there tapping away, as dictation does at present. (I once worked for a civil servant who, unable to dictate off the cuff, used to write out all his letters in longhand before dictating them - I hope he's bought himself a word processor.)

The manager's formatting requirements will be even more rudimentary, as the secretary's supposed to take care of all that. At the most he means to print out draft documents, perhaps for reference while the disk's being processed in the 'outer office'.

In any case, we're talking only rudimentary facilities by word processing standards, what does he want? Ease of learning is going to be his main priority, as few managers have time to learn how to use a really complex system. User friendliness is essential, too. The manager needs a simple system which he can sit down and use after spending the minimum time with his nose in an instruction manual.

Printerwise, the manager should be perfectly content with a dot matrix unit for rough drafts. The secretary is our fourth user type and is probably the most demanding user of all. She will need a system with extensive editing and formatting commands and the fact that these may require a special training course to master should not be a particular disadvantage - the cost of such a course, in reports as well as money - should amply repaid in terms of the greatly increased efficiency brought about by the word processor.

On the other side, the secretary will still want extensive facilities. After all, she's got to read through her boss's drafts, correcting spelling and punctuation and inserting commands for the formatter. She also wants to be able to replace commands to correct any abbreviations used by the boss. (Search and replace commands are one of the beauties of word processors. In writing this article, for example, it would have been tedious to keep typing 'word processor' or 'word processing', I therefore used the abbreviations 'wp' and 'wping' and used the replace command to replace 'wp' with 'word process' throughout before printing the final text.)

The secretary might also require a special kind of text entry facility, the ability to build up files. For example, suppose the marketing department wants to send letters to several hundred prospective clients. A file of names and addresses can be created on disk, each with a code to indicate the products that a particular customer is interested in. A second file can then be created of standard paragraphs, each describing a product corresponding to a particular code. The secretary then prepare a standard letter and get the word processor to type out an 'individual' letter to each client, pulling the name and address off the file, typing it at the head of the letter and then inserting the correct standard paragraph at the appropriate place within the letter.

Summarising these, then, we have four users with different requirements:

- Author/journalist: needs powerful editing, simple formatting, ease of use
- Report writer: needs powerful editing and formatting, would be prepared to spend some time learning.
- Manager: needs simple editing and formatting, ease of learning.
- Secretary: needs powerful, complex editing and formatting, will be prepared to take a training course if necessary.

Choosing the hardware

Several elements are necessary on the hardware side. First of course, you need a computer with a full alphanumeric keyboard and screen, so you can type in your text. Then you need some form of mass storage device on which to store the text when you've finished typing it in; while it's possible to use tape for this, disks are far more practical, especially if you're going to use the word processor for other text (anything more than single-page letters, in fact). Finally, you need a printer so that your prose can be immortalised on paper.

In choosing the hardware - the computer or word processor system - you'll have to take several things into account. First and often overlooked, is the ergonomics, with the keyboard layout of most systems being like a computer or 'text buffer' as possible in the machine), the happier you'll be.

With disks, there's something of a
compromise to be made. Most micros are available with 5/4in minifloppy disks, which are convenient but if you're going to use a lot of disk space for word processing, you can consider 8in floppies or even hard disks. Be warned about the latter, though: cost rather than the amount of pages of text, by far the work out the disk capacity you need holds roughly 450 words, you can of how many words this equals and `kbyte' is, roughly, a thousand character disks - typically 15 characters per second - and quite noisy. Daisy-wheels are quieter and faster - 45 - 60 cps, usually - but cost from around £1000 upwards. Most printers take fanfold paper which comes in continuous sheets with holes along both vertical edges to allow the printer mechanism to pull it through and horizontal perforations so that it can be re-routed or folded into individual sheets. It's not the stuff for serious business correspondence, although you can buy it ready-printed to form invoices or whatever, further, like most printer-based products, its physical format was devised in the States where they haven't heard of international standards, so that a typical paper form is 9/1/2in by 11in instead of the standard A4 format of 210mm by 297mm. All this is building up to say that if you want to print letters on your own company stationery, you'll probably need a 'steed-feeding device to attach to your printer; currently these are shockingly expensive, typically £8-700 on top of the printer price.

Choosing the software

On the software side, there are two distinct sections to a word processing package. First, there's the input section, usually called the 'editor', which allows you to input, alter, move and carry out more sophisticated actions such as searching for every occurrence of a particular letter, word or phrase and substituting another. Having prepared your text with the editor, you use another section called the 'formatter' to prepare it for printing. This side of things is concerned with the appearance of the text on paper and usually provides facilities for setting margins, centering headings, numbering pages and justifying text (making the right-hand edge line up, as it does here on this page). The commands to do this are frequently embedded in the text, denoted by special marker characters, during the editing stage.

Generally, the more complex word processing packages come with the editor and formatter as two separate programs. You use the editor to save it on disk and run the formatter to print it out nicely. This can be quite inconvenient if you start printing and realise you haven't achieved quite the format you wanted; you've got to exit the formatter, run the editor, make the necessary changes, exit the editor and save to disk before you can re-run the formatter. The big advantage of the 'split packages' is that they leave more memory free in the computer for text. If you want only simple editing and formatting features, or if you're content with a smaller memory buffer, then the integrated package is usually more convenient.

If you have already been investigating microcomputer word processing systems come with all sorts of useful things like special function keys and, in some cases, full A4-sized screens. Then there's the question of back-up or maintenance; dedicated systems are marketed by large office equipment manufacturers who already have extensive maintenance procedures, something noticeably rare on the microcomputer scene. Finally, the big manufacturers offer almost guaranteed compatibility within the system, as new products are announced a year or more after you bought your system.

Comparing WP systems

Having decided that you need a word processor and having decided which type will fit your current and future requirements, your next problem will be to sort out which of the (possibly) several systems is the best one for you. This will usually involve visiting numerous showrooms and being subjected to slick sales patter and dazzlingly confusing demonstrations. Listen to the sales patter by all means but be sure to ask all the questions which remain un-answered.

Unfortunately, no salesman is likely to let you test the system in the best possible way - by letting you take it away for a fortnight to try out. Disks are all too easy to copy and anyone with a Xerox machine can acquire his
First things first. Small business computer hardware or software - which comes first? At Peachtree we know that software has to come first.

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I'd like to know more about PEACHTREE business software products.

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Please return to Susan Jane, Peachtree Software International, MSA House, 99 King Street, Maidenhead, Berkshire SL6 1YF. Telephone Maidenhead (0628) 71011 Telex: 847400 MSAUK G MSA (Management Science America) Ltd is a subsidiary of Management Science America Inc.
own documentation, so the salesman won't let it out of his sight until you've parted with your money. At best you'll be left alone for an hour or so to try out the system but even this may not be possible if other clients are waiting. Trudging from shop to shop is also very time-consuming and there's no guarantee that you'll find the system you really want at the end of the day. Which is why we've decided to Benchtest word processing packages.

A standard piece of text has been chosen for use in all WP Benchmark tests. It is, in fact, the first 3000 words of the Microwriter review printed in the December 1980 issue of PCW and contains 17,772 characters. The number of occurrences of the string 'Microwriter' has been increased to a nice, round 50 for reasons which will become apparent. The text has been typed in and saved on disk, the following series of tests is performed and timings taken:

1. Load the text from disk into memory for editing; this time includes editing the editor program - if it is not possible to load the editor and text with a single command line, separate timings are taken for calling the editor and loading the text and are added together to give a total;
2. Save the text to disk and exit the editor;
3. With the text re-loaded, jump from the end to the start;
4. Jump from the end to the start;
5. Substitute 'Microwriting' for all 50 occurrences of 'Microwriter', each string 'Microwrite', 'Microwrites' and 'Microwriting', each

The Benchmarks are primarily designed to show how the easy or difficult the system will be to live with when you're editing large amounts of text. If your application involves shorter texts, they will be of less interest, although Benchmarks 1 and 2 will be important as, if you're editing many short documents, the time taken to make only one complete copy. The Benchmarks are then repeated as before, except, of course, that we have 100 substitutions to make if we have the original plus one copy in memory. All this gives us a second set of timings. We can now calculate a degradation factor using the formula f=(t'/t)(n/b) where t is the second timing, n is the number of copies of the 3000-word text in memory and b is the base time for the operation. Figure 1 gives some dummy timings to show how this will appear. As you can see, increasing the amount of text actually speeds up the time taken per 3000 words, particularly in the disk read/write tests.

Fig 1 A set of dummy WP Benchmark timings showing degradation factors.

Finally, you may have noticed that I haven't mentioned a fifth type of user, the private user or hobbyist. If you're in this group, you haven't been forgotten but you're in a much more fortunate position. The 'Gang of Four' described earlier. While you have to worry about things like cost-effectiveness, staff training time and maintenance contracts, your only worry is whether you can afford a particular package.
A Case For Discrimination.

Discriminating computer users don't want the best known word processing software. They want the best word processing software.

Hewlett Packard, for instance, spent 9 months comparing 7 microcomputer word processing software systems—including the most popular brands—for distribution with the new HP125 microcomputer.

Hewlett Packard's conclusion: Spellbinder is superior to every other system evaluated.

The reason? Spellbinder's unrivalled ease-of-use and superior capabilities. Spellbinder requires fewer keystrokes for entering and editing text, and provides more flexible printing options without changing the way you enter text. Spellbinder and an inexpensive microcomputer easily rival dedicated word processing systems costing up to three times more.

In addition, Spellbinder offers features for mass mailing and for professional legal texts. The price also includes forms handling and “boiler plate” features to store and merge commonly used documents, forms, and paragraphs.

Best of all, Spellbinder's lofty capabilities are available at a very competitive price. In fact, some of the bigger names in word processing packages demand a much higher price, for a package with far fewer features.

Hewlett Packard wouldn't settle for less than Spellbinder. You should be just as discriminating. See your nearest computer dealer for a demonstration of Spellbinder. Or call Encotel on: 01-686 9687/8
The introduction of a brand new word processor is a major event and AJEDIT is without doubt a major program. There are, however, quite a few Word Processors around and most of them are extremely good ones - why, therefore, another? The question is even more pertinent when it is known that we specifically commissioned the writing of it from an author of the status of Denville Longhurst of Enhanced Basic fame. The answer is that user feedback shows that a large number of customers do not need or want word processor programs which require a quantity of training before use. Scripsit, for instance, is an excellent program, but is complex to use; it even comes with a training course on tape. If one operator is dedicated to using the word processor then it makes sense to have her trained, and the more complex the program (so long as the complexity is accompanied by more and bigger functions) the better.

AJEDIT has been written for the user who needs a word processor intermittently, say three or four times a week. Its prime design criteria was ease of use - and just as importantly - ease of recollection of its commands. Take, for instance, the text editing commands - they are as close to the Basic Edit commands as possible, so that the user will remember them: To insert type I, to delete D, to take out three letters type 3D and so on.

Furthermore, AJEDIT has benefited from being written after a number of other word processors. The deficiencies in its predecessors are corrected in AJEDIT. For instance, any control characters can be outputted so that full advantage can be taken of the features of the particular printer being used. Disk directory access is available from within AJEDIT as is the killing of files on the disk. The FREE command and a number of other DOS commands can be carried out from within the program with a return to AJEDIT - with its text intact.

AJEDIT contains close to one hundred commands covering most word processor requirements. Dedicated printer commands for the Epson MX series and the Centronics 737 are included - again for ease of use of these two popular printers.

One of the big features of AJEDIT is the ability to “mail-merge”. The facility is available whereby two special files are created, one containing names and addresses and a salutation, the other a standard letter or form. AJEDIT will call the address and salutation from one file and the letter from the other and thereby compile personalised letters. The salutation may be repeated in the body of the letter.

AJEDIT needs 48K and one disk minimum and is suitable for the TRS-80 Models I and III and the Video Genie Models I and II.

AJEDIT .............. £49.95
Inclusive of V.A.T. and P. & P.
MagiC Wand is a very comprehensive word processing package produced by Small Business Applications Inc of Houston, Texas. It runs under CP/M and is one of the most versatile micro-based word processor systems currently available.

This test was carried out on a 64k Intertec SuperBrain running CP/M 2.2, with twin double-density minifloppy disk drives and an Epson MX-80 dot matrix printer. The version of Magic Wand tested had been specifically adapted to the SuperBrain and the computer itself had a set of special function keys replacing the normal numeric and cursor control keys.

Magic Wand comes as two separate programs: a text editor, with which you prepare your text, and a text formatter, which types the text in a format specified by you during the editing stage.

Editing

The editor is called from CP/M simply by typing EDIT and the file name, which can be either a new file or one already existing. You can type a second file name on the same command line and the results of your efforts will then be saved under this second name, which is useful if you want to leave the original file unaltered. Otherwise, Magic Wand saves text under the first file name and preserves the original file as a back-up.

Once the editor has been loaded, you're asked to insert the disk holding — or to hold — the text file and if the editor can't find the named file on the disk it asks you to confirm that you're working on a new file; this ensures that you'll notice if you intend to work on an existing file but had accidentally inserted the wrong disk.

You then find yourself looking at the command screen, which shows you what files are in use, the number of words and characters in the text buffer, the number of characters remaining and the current line length and tab positions.

A range of commands can be executed from the command screen, most of which are activated by only one or two letters. Typing an illegal command or a '?' causes a menu of all commands to be displayed; typing a command followed by '?' provokes a terse, single line explanation of the command.

Having set up the screen line length and any tabs you need, you move from the command page by pressing return. If you're working on an existing file, you'll notice if you attempt to type at the bottom of the text; with a new file, the screen blanks discontinuously — the electronic equivalent of a fresh sheet of paper.

The Magic Wand editor provides all the facilities one expects from a good screen-oriented word processor. There's no need to hit return when you near the end of a line as the system has automatic word wrap-around — if the whole word won't fit onto the line, it's completely transferred to the start of the next line, which aids readability tremendously. Not pressing return takes a little getting used to but it speeds up editing significantly; you can, of course, use return to force an end of line — at the end of a paragraph, for instance.

Special function keys are provided for all the inserting and deleting. You can insert/delete a character at a time simply by positioning the cursor at the appropriate place and pressing the required key; the line is opened or closed automatically on the screen as you type. A 'full insert' key opens up several lines on the screen to allow you to type in large chunks of text — the mode is cancelled by hitting the same key again. Other keys allow you to scroll back and forth both a line and a page at a time, while another pair provides an instant jump to either the top or the bottom of the text.

Search and replace commands are provided via a special key; pressing it drops the cursor to the bottom line of the screen and you type in the strings to be searched for/replaced on this line. Search/replace operates on the text between the cursor position and the text end. A repeat search key is provided and is self-explanatory. Replace will take place on all occurrences of the specified string or on a specified number of occurrences; a query option is available, which allows you to miss out some occurrences if you wish.

Two commands deserve special mention. The Include command allows you to specify a file and incorporate all parts of it into your text. Thus you can have a file of standard paragraphs on disk and select from them as you compose your text. The system displays the text to be included and gives you the option of either slotting it in or moving on to other parts of the Include file.

Spool enables you to print and edit simultaneously. Having edited one file and saved it on disk, you can then get on with editing another, using Spool to print out the first one. The theory's fine but I found it nearly unusable since the system gives priority to servicing the printer with the result that response to the keyboard slows down dramatically, to well over a second between pressing a key and the character appearing on the screen, in some cases. It's pretty debateable whether using Spool would actually save you any time.

The block commands are straightforward but only allow you to have one block active at a time. Yes, there's a special key to insert block markers but these have to be deleted by returning to the command screen and using a special command after you've carried out your block operation.

The editor allows you to print a draft copy of your text; the printout is exactly what you see on the screen, which means that any embedded formatting commands (see below) are printed instead of being executed.

The text buffer holds 37,633 characters, just over 6000 words or 13 single-spaced A4 pages. Once the buffer is full (you're warned in advance) you must save the text to disk and continue on a new file. Magic Wand won't handle a file which is larger than the text buffer. If you're working on very long texts you may find this a trifle annoying as you'll have to split text into chapters or sections; it does mean, of course, that while you're working on chapter nine you can't zip back to chapter three to check what you said there. On leaving the editor, you are given the choice of saving the text on disk, either as a new file or as an update to an existing file, or of simply quitting without saving the text.

Formatting

Having prepared your text with the editor, you must first save it on disk before running the formatter program, which is called simply by typing PRINT followed by the file name.

At this point an annoying inconsistency manifests itself. Once again,
Magic Wand invites you to mount the disk containing your text file and press return. However, the formatter has no knowledge of the editor's command screen so the text is mounted, printing starts immediately after you hit return. Printing can, however, be aborted and you can start all over again, this time preparing for the fact that instead of hitting return, you can also enter commands: one allows you to preview the formatting instructions embedded at the start of the text and in the text if necessary, although if other commands occur later in the text, they will be executed when the formatter gets to them.

As well as entering the formatting commands after calling the formatter, you can also insert (embed) them into text during editing; they are separated from the actual text by the ']' character. If you happen to want to print that character, you can define a different character (or no character at all) as the command recognition character. Various other characters with special meanings such as for ghost hyphenation, can also be changed at will at any time in the text file. The formatting commands themselves can be entered either as abbreviations or in full to make them readable to less experienced users.

Magic Wand has some very sophisticated formatting capabilities as well as the usual ones provided by most word processing systems. Thus you can not only specify either justification (both margins even) or range right (ragged right margin, as produced on a normal typesetting machine), but you can also insert the extra spaces that will be printed between words and Magic Wand seemed to allow the insertion of single sheets into the printer; and the ability to print multiple copies of the same document, with or without a pause between copies.

As the Epson doesn't permit variable spacing between letters, justification was performed by adding spaces between words and Magic Wand seemed to do this particularly intelligently, frequently inserting the extra spaces after full stops or in the middle of lines instead of just at one end of the line; the result is a very neat printout.

Various other features are included to make life easier for the operator. You can insert comments into the text file which will not be printed during formatting; NOTE prints a message to the screen only; WAIT stops the printing and waits for a command to be typed in (you can add a prompt which will appear on the screen); and SHOW prints on the screen the first few lines of any variables (see below) you specify, together with whatever explanatory text you require.

Summarising, the Magic Wand formatter is extremely powerful, as powerful as any user is likely to require without having resort to full typesetting facilities. It enables the user to produce simple formatted documents with great ease and complex formatting with little extra effort.

**Files and variables**

If the features I have described so far were all that Magic Wand offers, it would still be a powerful tool for many applications. This allows you to preview the formatting instructions embedded at the start of the text and in the text if necessary, although if other commands occur later in the text, they will be executed when the formatter gets to them.

However, Magic Wand offers a great deal more than this and in the provision for variables with accompanying commands which are on the verge of being a programming language, plus the ability to set up files which can be referenced by Magic Wand as it is printing text.

Files are set up using the editor as though they were pieces of normal text. The files can be either 'data', such as names and addresses, together with other details such as the salutation used for each person ('Dear Mr Harris,' or 'Dear "Bumper,"', for example) and any other details you require; or they can be paragraphs of text which you might wish to incorporate into standard letters to customise them.

There are four types of variable: string, numeric, formatted and system which you can have up to 128 variables in any one file. String variables can be up to 55 characters long (you can set them to shorter lengths to save on memory space) and your can reference the first n characters of a string. Numeric variables are positive integer only in the range 0 to 32767. Formatted numeric variables, used mostly for amounts of money, are printed out to two decimal places with commas - $1000.5 would be printed as 10,000.50, for example and you can set this to print out in continental format: 10.000,50.

There are also two special types of variables: active and output file names, part of another file ('Workout') is being included and a fourth file is being printed in the background. Also shown is the commands help menu.

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user), the pass number for when you're printing multiple copies of a document, the current file record number being accessed, an end of file marker, current line and column numbers and the number of lines left on the page. You can use this last to force a new page before printing a heading if there aren't enough lines of text after it — that way you avoid ending up with a heading on the last line of a page.

Coupled with the variables are conditions, which allow you to test for a condition and act according to its value: IF NAME = "Fred", SKIP 4 would skip the next four lines if the value of the string variable NAME was "Fred", for example. So, you can get variables from a file of, say, names and addresses and print one of a variety of different paragraphs according to the variable's value.

You could use Magic Wand for many applications without even using the variables feature; with variables, you have a word processor of great sophistication and power which would prove a very useful tool in a business environment.

**Learning and documentation**

As you will have gathered from the above, if you want to exploit the full potential of Magic Wand, you have a lot of learning to do. Fortunately, this is made very easy by what must be one of the best examples of documentation in the micro world.

The first two-thirds of the manual are a series of lessons which take you step by step through the use of Magic Wand's abilities. The lessons use a series of text files which are on the disk with Magic Wand — you play the part of Abraham Lincoln's secretary, working on a draft of the Gettysburg address, which you have to polish and alter until the actual address results. You then go on to set up standard replies to various types of letters (from friendly to threatening) and a file of names and addresses so that each person gets the reply he deserves.

At each step you're given a photograph of what the screen should look like and reproductions of the printout produced by it. These are very useful for checking that you're actually doing what you're supposed to be doing. The lessons are structured so that you can drop out at whatever level meets your requirements — there's no need to wade through files and variables if you want to use Magic Wand for straightforward text editing and formatting. That's been thought out; it will explain any technical terms in full as they arise so that the complete novice can sit down with the manual and feel quite at home with the system from the start.

The final section of the manual contains summaries of the editing, formatting, files and variables commands. Two of the commands which appeared on the editor's command screen were nowhere explained in the manual but this apart, the summaries were well-written, logically laid out and easy to use.

This book also includes a brief introduction to CP/M, explaining all the features which are likely to be of concern to Magic Wand users.

**Users**

Because of its wide-ranging facilities Magic Wand should prove useful to all four of our 'standard' users (outlines in the introduction to this series last month), although some of them would have to polish and alter until the lessons are adapted to their requirements.

The text buffer capacity of just over 6000 words could be regarded as a handicap unless you accepted the minor inconvenience of working by chapters and storing them as a series of separate files. The author/journalist would be most affected by this feature and in fact this user would be unlikely to make use of many of Magic Wand's capabilities, especially the files and variables facilities. On the other hand, many authors would find the hardware/software configuration attractive — Magic Wand is easy to learn to the level required for this use and the SuperBrain, with its integral construction, sits tidily on a desk. The Epson is a very civilised little printer for this application.

For the report writer there's again the 6000 word limitation but this is probably less of a problem than for the author. Again the report writer would probably not use the package's more sophisticated facilities but the very extensive formatting features would be of immense value in this application. Coupled with a high-quality daisy-wheel printer (the Epson would be useful only for rough drafts to check formatting), Magic Wand should fill most report writers' needs.

The manager would also find Magic Wand useful, although he would certainly use only a few of its capabilities. His requirement for quick and easy learning is more than met by the excellent manual and, of course, the extra facilities are still there for him to get to grips with for urgent work on the secretary's day off. The Epson would be at home in the manager's office for draft work since it's neat and unobtrusive.

In the introduction to this series, I said that the secretary is probably the most demanding of all four users. Magic Wand has been devised quite clearly for use in a busy commercial environment and would meet most requirements in this area. The system is friendly and foolproof that, to make use of its full facilities, the secretary would want to go on some kind of a course — although the manual is certainly sufficient, a busy office hardly the place to sit and learn the advanced features Magic Wand offers.

**Hardware**

The SuperBrain was Benchtested in PCW, August 1980 so I shall not go into its technical features and will concentrate on its suitability for word processing.

Firstly, the keyboard felt a little flimsy to me — the keys have a very light touch and a rather tinny feel to them.

The display was quite civilised, having a matt-finish screen to cut down reflections and a brightness control at the back of the machine. The character set is a little odd; characters such as 'g' and 'y' have proper descenders but these don't actually descend — instead, the characters are raised so the bottom of the descender aligns with the bottom of other characters. The overall effect was rather like the graphitic look Sue Eisenbach in her Benchtest of 'vaguely ransom note' but the novelty quickly vanishes and after a couple of hours I didn't even notice it.

The disks each have a capacity of 179 kbytes, about 25,500 words or 56 A4 pages (single spaced), which is probably adequate for many people. The disk drives on the model I tested were permanently running — this creates noise (not too much) but, more importantly, increases wear both to the disks and the drives themselves. You can reduce disk wear by removing the disks once you've loaded them and writing the text but drive wear might prove a problem. Some models of the SuperBrain have been modified to turn off the drives when you're not using them but this problem won't apply to those.

Any cheap printer with an RS232 interface will plug straight into the SuperBrain's auxiliary port. Another RS232 port is provided which allows linking to other computers, directly or via modems, quite easy. High quality daisy-wheel printers can also be hooked up and, because the SuperBrain comes all in one box, there'll be a minimum of trailing wires to trip over in the office.

The special function keys which replace the SuperBrain's usual numeric and cursor control keys contributed to the whole system very easy to use but at £50 they're very over-priced.

The Epson MX-80 is a very nice printer. It's a well made machine as one would expect from a Japanese these days, is compact, light and very quiet. As the Benchmark results show, it's not particularly fast despite its bidirectional printing but the print quality is very good, as shown in Figure 1. Quite a variety of typefaces are available by sending sequences of control codes; of these, the emphasised condensed gives very good results. It would, at a pinch, pass for correspondence quality for those not-too-vital
letters. By changing switch positions inside, you can get standard ASCII, English, French, German and Japanese character sets, the European character sets differing in that the English set gives a '£' sign instead of '#' and the others provide accents and umlauts. TRS-80 graphics are also in there, unless you set up for Japanese characters, which replace most of the graphics. Depending on which character set you choose, the Epson prints over 40, 66, 80 or 132 columns and takes paper from 4in to 10in wide. I tested the F/T version, which has both pin and friction feed; these mean that, by disabling the paper-out sensor (with a special control code or a screwdriver), you can print on single sheets. The printer will accept one original plus two carbon copies. It uses a cartridge ribbon which is very easy to fit and the print head can also be replaced by the user—the manual tells you how to do it and replacement heads cost about £15 The bell, incidentally, is very loud.

Summary
Magic Wand is designed specifically for commercial use and as an office tool it's a winner, providing a wide range of extremely powerful facilities. The secretary will be its heaviest user but the report writer will also find it very useful for its powerful formatting capabilities. Thanks to the excellent manual, most users should have no trouble in learning the system to whatever level they require.

Coupled with Magic Wand, the SuperBrain is very good for word processing, especially when fitted with the special function keys, which make a major contribution to the system's ease of use.
The Epson is a very nice printer, certainly one of the better low-cost dot matrix printers on the market today. For draft or manuscript production it's ideal, but serious users will require a daisywheel unit to produce correspondence and report quality material.

WP Benchmarks

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Claimed printing speed: 80 cps Tested speed: 45 cps (485 words/minute)

* See April 1981 PCW for details of WP Benchmark tests

Prices (excluding VAT)
Intertec SuperBrain, 64k RAM, twin 5¼in disks: £1595
Special function key set: £50
Epson MX-80 F/T printer: £299
Magic Wand: £250

Our thanks to the London Computer Centre for the loan of the hardware and software for this review.

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The Tuscan S100, Britain's first S100 computer on a single board, is now available with designed-in mini-Winchester drive for better performance, shorter access time and higher transfer rate. All this from Britain's own home-grown micro manufacturer.

Systems with printer, screen and CP/M start at £2125 with twin floppies, and at £3625 with one floppy and one 5-meg. mini-Winchester.

SOFTWARE. Business accounts packages start at £800 when purchased with the Tuscan system. Word processing packages start at £315; Database packages start at £100.

HARDWARE. Flexibility is the key feature of all Tuscan systems. A choice of storage capacity, video format and graphics is available. The Tuscan S100 can read and write in sixteen different disk formats, with a choice of 5½" or 8" drives.

SUPPORT. The Tuscan S100, designed and built in Britain, is backed by Transam's substantial experience in electronics plus a dedicated hardware and software team. National third party maintenance is available at ten per cent of hardware costs.

BUSINESS SYSTEM DEALERS. Business Equipment Centre, 10 Edge Lane, Liverpool. Tel: 263 5783. Contact: Rod Crofts.
Purley Computers, 21 Bartholomew Street, Newbury, Berkshire. Tel: 41784. Contact: Ron Smith.

FURTHER INFORMATION. Two new catalogues covering “systems and peripherals” and “CP/M Software” are available, giving details of our systems and services. Call or write for yours.
The Apple II is one of the 'old faithfuls' of the micro world; it has been around for ages (or so it seems) and is one of the world's top-selling machines. This means that programmers and retailers have had plenty of time to get used to its quirks and that plenty of companies have been able to produce hardware additions to plug into the slots provided inside the case for this purpose.

The result is that, no matter how weird your application, it's quite probable that someone, somewhere has produced a piece of hardware and/or software to do the job on an Apple.

Word processing isn't, of course, a particularly weird application but the standard Apple II is not really suited to the job, mainly because of its 40-column screen and its lack of a true, typewriter-action shift key. (And please don't write in to say that you find 40 columns perfectly adequate for WP; either you haven't tried an 80-column system and don't know what you're missing, or you're not processing lots of business-type words.) Both these drawbacks can be overcome, though; there are several 80-column plug-in cards for the Apple and a proper shift function can easily be fitted. All you need now is the WP software.

This review is of a twin-disk Apple II Europlus, fitted with a Computer Stop 80-column card. The software package is Format-80, produced in-house by Apple specialist Personal Computers Ltd (no relation to this magazine). The package is an all-in-one editor and formatter which, as a bonus, includes a mailing list handler.

**Editing**

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You can move the cursor back to correct mistakes, using the back-arrow key, but the forwards arrow key presides as tab function since there's no tab key on the Apple's keyboard. Tab positions can be set while in the entry mode, the positions being shown by little arrows above and below the text area on the screen. Right and left margins can also be set and these are shown by white bars above and below the text. There's a column counter at the top of the screen to help set margins and there's also a line counter.

A shift lock is provided by pressing control and shift together and is unlocked by pressing shift as close as it's possible to get on the Apple's keyboard to that of a real typewriter.

You enter the format mode by pressing escape, which has a toggle action; the screen tells you which mode you're in, which is important because in format mode, nearly every key activates a command. Though there's a cursor action, it's only a replacement for the Apple's keyboard to that of a real typewriter.

Text can be inserted at the cursor position and a simple, one-character delete function is activated by hitting the 'X' key. More elaborate deletion is also provided, operating on line, paragraph and all text and there's a blank command which differs from delete in that a blank space is left in the text, while delete closes it up.

There's a find command, which positions the cursor at the start of the sought text and there's a search and replace facility, oddly called edit, which is rather more intelligent than that on other machines: suppose, for example, you want to replace 'the' with 'some' throughout your text; unlike many other word processors, Format-80 will also act on 'The' and 'THE', replacing them with 'Some' and 'SOME', a very useful feature indeed.

A block move command is available, which allows you to place a block in a reserved part of the Apple's memory and recall it later for insertion at any desired place in the text.

Format-80 provides a useful range of editing commands, then. The only real criticism I would want to make is of the amount of key pressing needed to act-control: the 'T' and space bar key function as expected, while up and down movements are also available. You can also move the cursor to the following word, line, sentence, paragraph or text block, jump to the start or end of similar locations or scan backwards or forwards through text at variable speeds to check it. The Apple has a repeat key, a must for cursor movements.

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followed by L for line, then escape again to continue entering text. The reason is partly that care has been taken to keep the commands easy to remember and to provide sub-menus wherever possible, and also that the Apple's keyboard has no spare keys which can be dedicated to special functions; it would be interesting to know whether the add-on numeric keypad unit, with suitably re-labelled keys, could be used to activate some of the more frequently-used commands.

Saving text to disk is quite straightforward. Each page of text must be given a name and a number so that a document can be split into several pages — ‘Text 1’, ‘Text 2’, etc. Format-80 won't let you save a page with the same name and number as a page already on disk; you have to use the replace command instead, so there's little chance of accidentally over-writing your previous efforts. Each disk can hold up to 17 900-word pages. One annoying omission is a disk-to-disk copying command, so backup copies have to be made by loading individual pages from one disk into the Apple's memory and then saving them onto the other disk.

Formatting

Format-80's formatting is a mixture of pre-set system parameters and embedded commands. The embedded ones are entered while editing, using the format mode, and have an immediate effect — you can see what you've done and undo it if it's not what you wanted. In this way you can centre lines, justify text, close up blank spaces, insert printer codes, de-justify, slide lines up and down and slide words left and right. You can also align numbers by decimal point, which is handy, although Format-80 contains no mathematical functions for adding columns of figures. (One of the nice things about reviewing Format-80 was that, as it's a British product, its author Mike Hardwick was but a phone call/tube ride away. The reason for not including maths functions, he explained, was that he felt that such functions shift responsibility for the figures away from the boss to the secretary. I see his point, although I'm not sure I agree that such a shift is always a bad thing.)

Another range of formatting parameters can be set up and saved on the master disk. These include the number of lines per printed page, what happens at the end of each page (form feed or wait for a key to be pressed, for example), the pagination start number and details of the header and footer. Special ASCII character sequences can be specified to be sent to the printer in response to printer codes embedded within the text, allowing the system to cope with special printer functions such as bolding, underlining, super- and subscripting. Format-80 can also cope with the proportional spacing found on the more exotic printers. The parameter file also includes comprehensive heading and footing options, which is a little inconvenient, as you can't then easily change these within a document. You can print either the text in memory or one or more pages on disk and multiple copies are catered for.

There is also a facility for previewing the text on the screen in its final format, with pagination, headings, etc.

Mailing list

Format-80 contains a mailing list handler which allows you to build up and manage a file of up to 442 names and addresses per disk. Each line of each entry can be given a label and lists can be sorted by any of these labels; you can also create a standard letter incorporating label names and these will be substituted in each copy of the letter by the entries corresponding to those labels. Comments can be added under each mailing list entry.

The version of Format-80 tested was a pre-release version and had one or two features yet to be finished; one of these was a logical function which will
allow, for example, selective printing of names and addresses depending on the contents of the labels' fields. Thus you could, for example, address letters to the体检 of every solicitor in Birmingham whose name wasn't Smith, for instance.

There are facilities for reviewing, altering and deleting records in the list and for initialising disks. This last function is a little awkward as it doesn’t allow you to initialise an unwanted text disk for mailing use — you have to initialise the disk using the Apple disk operating system and then re-initialise it from the mailing list section of Format-80.

As the tested version of Format-80 was incomplete (as well as the mailing list logic, a whole-document word search and replace function hadn't been implemented), the accompanying documentation was also preliminary, taking the form of an 11-page 'First-guide'. This briefly explained most of the package’s features apart from the mailing list and was intended as a very quick introduction to the system. By the time you read this review, the final version of Format-80 should be ready, complete with 200-page manual which, in view of the high standard of the software, I would expect to be very good.

As I said last month in my review of Wordpro 4 Plus, being a member of the author-journalist group, I don’t find this system which enforces the splitting of documents into a number of separate files particularly convenient to use. If you weren’t bothered by this, though, the system contains all the editing and formatting functions you’re likely to need. Public relations-type persons might find it particularly handy for writing and mailing medium volumes of press releases.

The report writer would also find the system limiting, but to a lesser extent than an author, although the formatting commands — of great interest to this user — are not particularly powerful. The system does, however, allow good printer control, so fancy typefaces, etc. could compensate for this.

For the manager or small business-person, Format-80 could prove a valuable tool; like Wordpro on the SuperPET, it gives you a useful WP system while allowing the computer to be used for other things — there are certainly plenty of good business software packages available for the Apple.

Secretaries would feel very at home with this system. One of the main considerations in the package’s design has been to make the hardware as much like a normal typewriter as possible, in terms of the way it's operated, while taking advantage of the features which only a WP can provide. This is as it should be, for a word processor is a piece of office equipment, not a computer, and should therefore be as user-friendly as possible. Format-80 is friendly and would make a useful general office tool.

Hardware

As I said at the start of this review, the Apple has been around almost since the dawn of the microcomputer age; it’s a well-proven, well-known machine with a good reputation for reliability and has a good international coverage. If it does go wrong, then there are plenty of people around to help you out.

For word processing, I found it quite pleasant to use. The keyboard felt a little cramped as it’s slightly smaller than that of a standard typewriter, but the keys have a nice solid feel to them. A major horror when using the Apple as a computer is accidentally hitting the reset key when you intended to hit return, thereby destroying the program in the memory; with Format-80, hitting the reset merely puts you back to the master menu and leaves the text in memory unchanged.

The modification to provide a true shift key is very simple and Personal Computers will do it for free if you buy either a complete system or just Format-80 from them; if you can’t take your Apple along to have the mod done, PC will supply a circuit diagram, instructions and telephone advice for you to either do it yourself or have it done by a local dealer. The mod includes a switch at the rear of the machine to restore the Apple’s normal shift function, should you also want to use it as a computer.

The output from the Computer Stop 80-column board is of good quality, although there are no true descenders on letters with ascenders and ‘g’, the display actually has 81 characters on 25 lines, but the user is supplied with two copies; back-up copies of text and mailing list disks can be made using standard copy utilities. And 10 user-definable keys have been provided through CTRL o-9 to allow special characters and/or printer macros.

Format-80 works with the majority of 80-column cards, not just the Computer Stop board and, as a bonus, Videx Videoterm users get an inverse ROM. Any Apple-compatible printer can be used. Format-80’s authors are Michael Hardwick and Gordon Beckman of Elite Software Co; it is distributed by Personal Computers and is available from many Apple dealers.

Summary

Format-80 is a friendly, well-designed word processing package which provides a useful range of functions for general office/small business use. It would appeal most to small business users, especially those wanting to use their Apples for other purposes. It’s a particularly helpful system, with menus and sub-menus for almost every command, although the penalty paid for these is that you have to make more keystrokes to activate some functions than are necessary on other systems.

The Apple in the configuration tested is a pleasant machine for word processing, has a good reliability record, plenty of service backup across the country and can be used for many other applications.

Finally, because of the system’s 900-word maximum page capacity and the lack of the document-wide search and replace function on the version tested, it wasn’t possible to run any of our WP Benchmarks.

Prices

48k Apple II with twin disks and monitor £1664
Computer Stop 80-col board 175
Format-80 300

Prices exclude VAT and are those of Personal Computers Ltd, whom we would like to thank for the loan of the hardware and software tested.
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**SOFTWARE**

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Vector Graphics is an American microcomputer manufacturer which makes no secret of the fact that it's interested only in selling business machines. In the States, in fact, it doesn't even advertise in the computer press, preferring to concentrate on the sort of publications that businessmen read.

The current range of Vector Graphics machines starts with the single-disk VIP (which we Benchtested in February this year), continues through the twin-disk System B and 2800 systems and peaks with the recently-launched 3005, which has one minifloppy disk and one 5 Mbyte winchester hard disk.

Vector Graphics markets a number of packages, including a Visicalc-like planer called Execuplan and a word processor called Memorite III, the subject of this test.

Memorite III will run on all the Vector Graphics machines but I couldn't resist the offer of the top-of-the-range 3005 as the hardware to test Memorite; I'll talk about the hardware in more detail later.

Editing

Memorite III is a combined editing and formatting program which, although it runs under CP/M, has been designed specifically for Vector Graphics machines ('six man-years to develop,' says Vector).

With Memorite loaded, you're left with a text buffer of 30, 170 characters, approximately equivalent to nine and a half single-spaced A4 pages.

The editor provides a good range of facilities and, although there are plenty of commands to remember, they are all simple and most are sufficiently logical that they very quickly become second nature to use.

As with most of the better word processors, Memorite gives word wrap-around, enabling you to dispense with pressing return at the end of each line, which speeds up text entry enormously. Four cursor movement keys are provided and the up/down keys, when shifted, provide backwards/forwards scrolling; this last feature can be changed to display screenfuls at a time rather than continuous scrolling. Keeping the keys depressed while scrolling progressively slows the scrolling speed, right down to almost one line per second. You can also jump directly to the beginning or end of a screen or of the whole text. One nice feature is that, before scrolling or jumping around, you can save the cursor position and return to it immediately afterwards simply by pressing the escape key.

Inserting text is done either on a character-by-character basis or by opening a line on the screen, which, if not completely filled, will be closed up again when you exit this mode. Deletion works on single characters or from the cursor position to the first occurrence of any specified character; this allows you to specify a space for word deletion, a '*' for sentence deletion or even a return for paragraph deletion.

All the commands I have mentioned so far operate directly from the editing mode, mostly by pressing easy-to-remember control commands. Other facilities are available by exiting the editing mode to get into the command mode - these include all disk handling, search and replace, block moves and others.

In the command mode, the bottom three lines of the display are taken over with a two-line reversed video status display and a blank line beneath on which you type your commands (see photo). The status line shows the name and author of the document currently being edited, its length (in characters) and the number of unused characters remaining in the buffer, the type of printer for which the system is set up and the disk drives in use.

Block move is disguised as a copy command. This allows you to copy blocks of text from one part of the buffer to another but, as it gives you the option of retaining or deleting the original block, it also functions as a block move facility.

Search and replace ('find item' in Memorite parlance) is straightforward and allows you to operate backwards or forwards from the cursor position and has a query option, which allows you to leave some occurrences of the string being replaced as they are if you want to.

Tab stops can be set at every n characters or only in specific places; a tab ruler can be displayed to show you exactly where the tabs have been set and the tabs are saved with each document on disk, which makes life much easier if you use different tab layouts for every document.

The disk handling is simple and very well thought out; once into Memorite, the user is totally insulated from the unfriendliness of CP/M, which is good, and the system is simple to use and totally idiotproof.

Test files are saved by first giving them an 'identity'; this comprises a file name, of course, but also includes the author's name, a password and up to 25 characters of comment - the last two are optional. When you give the actual write to disk command, you are asked to type in the date in the American MM/DD/YY format (not DD/ MM/YY as it says in the manual); I found this extremely annoying as it's not a piece of information which I need to store with every document yet with Memorite it's compulsory, even when saving a revised version of a document already on disk.

Reading a file is very easy. Asking for the disk directory gives a display of all the identity information for each file as well as the number of revisions for each file and their dates: the date each document was created and the date it was last revised. The directory can be printed out if required.

To read in a file, you move the cursor to its entry in the directory, type 'R' and in comes the text, unless, that is, you've given it a password, in which case you're asked for the password and you can only obtain the text if you reply with the correct one; the password does not appear on the screen, either when giving the document its identity or when trying to retrieve text. The
password protection is, incidently, very secure; Memorite uses the password to scramble the text as it's saved on disk, so you can't read it by exiting to CP/M and giving a 'type' command — all you get is garbage.

When you revise a file, Memorite saves the earlier version as a backup. These backup copies aren't normally displayed on the disk directory but there's a special command which will display them, allowing you to read in a backup copy if you've done something awful to the working copy. There's also a command which will erase all backup copies from a disk to save space — use it with care.

Having finished your editing, you can either print the text out straight from the buffer or you can exit Memorite, either to the system's monitor or to CP/M. Whichever you choose, though, Memorite won't let you go until you've saved the text in the buffer onto disk, an excellent safeguard which can only be overcome by erasing the text first, pressing the reset button at the back of the machine or turning the machine off altogether.

**Spelling**

It's quite embarrassing to have typed in your text, formatted it and printed it out, only to discover some silly spelling mistakes (or have someone else discover them). It means you've got to re-edit and reprint, wasting time and paper. Memorite can help you avoid this because it comes with a spelling correction program.

SPELL comes as a separate program, incorporating a 30,000-word dictionary, which you run after you've saved your file on disk. The text is displayed line by line on the screen and any words which the dictionary doesn't recognise are highlighted in flashing reverse video. The program waits for you to either type in the correct spelling (but it doesn't tell you what that is!) or you can just press return, which causes SPELL to include the word in a 255-word temporary dictionary so it won't query further occurrences of the same word in the text.

Although 30,000 words sounds a lot, I found that SPELL queried a lot of words which I'd regard as fairly ordinary - 'microcomputer', 'camera' and 'eleventh', for example (also 'Memorite'). SPELL is also an American product, which means it will query things like 'colour' and 'recognise', which I consider to be slightly irritating — why doesn't someone come up with English versions of these spelling programs?

If you're a rotten speller, SPELL will be worth its weight in gold; for the rest of us it's also very handy for weeding out typing mistakes, which it does far more quickly than a human proof-reader could do (nonsense! — Irate Sub Editor), making it much more than just a gimmick.

**Printing**

Memorite III has a powerful range of print formatting commands, fewer than Spellbinder or Magic Wand but enough for most users. They're also fairly easy to use and the system has a sensible set of default parameters for formatting (ie, if you don't specify things like left and right margins, the system will use its own, pre-set, values which will give a reasonable-looking result).

If you don't like some of the default settings, you can create your own and incorporate them into the program on disk so that they will always be present when you run Memorite. The formatting commands are partly these semi-permanent parameters and partly commands embedded within the text. The pre-set commands can, however, be overridden by inserting different settings for them in text or by typing new ones in from the keyboard before printing.

All the usual formatting features are present: left, right, top and bottom margins, justification on or off, centred lines, etc. The system provides control over ghost hyphens and forced spaces, page breaks, indentation, character and line spacing, page width and length, and page numbers — you can start a document with page numbering from any page in the text. You can print directly from the keyboard, making the system an extremely expensive typewriter, and you can insert remarks into text which won't be printed out. Other interesting features include numeric justification, multicolumn printing, the ability to link documents together for printing and the capacity for up to five footnotes per page.

Built into the system is the ability to compile a file of standard paragraphs, each of which is given a label. You can then draft out, say, a letter to incorporate one or more of these paragraphs, except that you merely put the label in the desired place; Memorite then automatically merges the appropriate paragraph into the text at the appropriate place. Names and addresses from the mailing list facility (see below) can also be inserted automatically into text.

Page headings and footings, incorporating the page number in whatever position you want, can be defined and printed automatically. It's possible to define separate headings for left and right pages, if you're preparing camera-ready artwork for a book.
Mailing list

Memorite includes a mailing list facility, but it's in Microsoft Basic; fortunately MBasic comes with the machine. It's a suite of programs, driven from a master menu, which allows you to create/delete a mailing list, edit/display one, print it either as a list or on labels, or sort it by any criterion you choose — you're allowed to insert category codes when building the list.

The powerful sort program is a CP/M command program, not a Basic one, and seems pretty fast; unfortunately this didn't allow me to build up a large enough file of names and addresses to produce any meaningful figures for the sorting.

The mailing suite seems well thought out, is user-friendly and easy to use, with the mild exception of the label printing section. In order to cope with the massive ranges of sizes and shapes of labels, the program requires you to detail the label formats very carefully and specifically. It looks complex at first and requires a little experimentation, but, once mastered, isn't as formidable as it first appears.

I could find no reference in the documentation to any maximum length of mailing list. Given the megabytes of hard disk on the 3005, you could build up a really massive list and use the sort program to produce categorised sub-lists as required. Back-up copies would be a problem, though, if the list exceeded the capacity of a floppy disk — more on this in a moment.

Other software

Vector Graphics also markets a nice Visicalc-like planner called Execuplan. Other software is very limited. Users of our four hypothetical users, I feel that the business/technical report writer will find the system most useful, mainly in view of the other VG software available for the machine, especially Execuplan.

For general business users, the system would also prove exceptionally useful. As a word processor, it compares very favourably with dedicated machines on the market — one selling at around the same price, gives you only a single floppy disk, for example, while the 3005 has that hard disk as well! It doesn't have the special function keys, of course, which you'll find on most dedicated machines, but if I was buying a word processor for commercial use now I'd certainly put the VG very high on the list.

For the author/journalist, it's a little more difficult to give a definite yes/no. As I've said before, this user would
really like a machine which uses virtual
without saving the current file on disk
allowing you to skip back to
disk so you can work on a much larger
disk, and from the eventual limit on
especially
from the slowness of floppy disks, es-
disks; while it's very useful, it suffers
system at home, based on minifloppy
and loading the earlier file. I have such a
there's a brightness control at the back
an anti-reflective mesh in front of it and
keyboard is of type-
made, has a good, solid feel to it and
overcome.
for that would make it into an author's
work out a backing-up frequency that
has a 298k capacity, approximately 94
one each for the
sockets on the outside of the computer
Spinwriter.
The printer which came with the
You don't, of course, need to make a
make-up files of your files
floppy disks — some 16 floppies
remote terminal or tie a branch office into your
imagine being able to bring the world
life, or kế a branch office into your
inexpensive
tie. You can't afford to be without our products.
for £100. For further information about Micro Lab products, contact us
directly or go to your local Apple
computer dealer for a demonstration.

Hardware
The Vector Graphics machine is nicely
made, has a good, solid feel to it and
would look at home in any office
environment. The keyboard is of type-
writer layout and pitch and the display
is particularly pleasant: it gives 24 rows
of 80 characters and although a little
small, is very clear, with true descendents
on letters like 'p' and 'q'. The screen,
an anti-reflective mesh in front of it and
there's a brightness control at the back
of the machine.
And that hard disk? If you've never
used one, you can't imagine how nice it is.
Firstly, it's incredibly quick — take a
look at the WP Benchmark timings with
this review. And it holds a hell of a lot
of files. The disk is actually divided into
two as far as the system is concerned —
it looks and is used exactly like two
enormous floppy disks. Each 'side' of
the hard disk has 240K bytes
available to the user, roughly 764 A4 pages
of text per side! The minifloppy disk
has a 298K capacity, approximately 94
pages, which puts things into perspec-
tive. The system was set up with CP/M
on the hard disk, from which it picked
up from the monitor in under a second.
Hard disks are very much more
reliable than floppies but it would be
extremely foolish to expect total
reliability from them — there's always
a danger that they might fail and you
must make back-up copies of your files
onto floppy disks — some 16 floppies
would be needed to back-up the entire
contents of the Vector's hard disk, the-
oretically, but in practice you'd use
more than that number.
You don't, of course, need to make a
back-up copy of a file every time you
change one; it would be sensible to
work out a backing-up frequency that
depends on how much work you do and
how many hours or days' work you can
afford to lose if the hard disk crashes
before you've made back-ups.
The printer which came with the
system was the new NEC Spinwriter
7700, a thoroughly pleasant machine
producing very high-quality print from
even a nylon ribbon. It's fast and quiet
(both by daisywheel printer standards)
and has a claimed 27 per cent fewer
components over the previous Spin-
writer; it's still bloody heavy to move
around, though.

Talking of moving things around brings
me to my only major criticism of the Vector Graphics hardware — the
way in which the three modules (com-
puter, disks and printer) are connected
together. Firstly, the connections use
broad ribbon cables, one for the printer
and three for the disks, which not only
look out of place in an office but which
have a knack of tangling themselves up
untidily. Worse, though, is the fact that
you can only connect and disconnect
them by opening the computer and un-
plugging them inside — there are no
sockets on the outside of the computer
for them. This means that moving the
system around is a four-person job; two
for the printer and one each for the
disk, and from the eventual limit on
the amount you can get onto a floppy.

Summary
Memorite III is a well-designed word
processing package which would be of
use in general business and report-
writing applications but which would also
be more attractive to the author/journalist,
unless the latter was considering a dedicated
machine, in comparison with which
Vector gives exceptional value for
money.
The hardware is well made, apart
from the connections arrangement which needs rethinking, and the NEC
Spinwriter, newly available in this
country, is a very civilised machine and
a definite improvement on the earlier Spinwriter.

WP Benchmarks

<table>
<thead>
<tr>
<th>WP Benchmark</th>
<th>Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benchmark 1</td>
<td>3.3 (6.0)</td>
</tr>
<tr>
<td>Benchmark 2</td>
<td>6.1 (54.9)</td>
</tr>
<tr>
<td>Instantaneous</td>
<td>6</td>
</tr>
<tr>
<td>3</td>
<td>3.3</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>3</td>
</tr>
</tbody>
</table>

All timings in seconds. Benchmarks 1
and 2 (load and save text) were carried
out using the hard disk — times for the
same tests with the floppy disks are in
brackets.

Prices

- Vector Graphics 3005 £4750*
- NEC Spinwriter 7700 £2250
- Memorite III (includes SPELL and mailing list) £375
- Execuplan £150

*Includes CP/M and MBasic.
Prices exclude VAT.

inside the disk drive unit. The hard
disk is the nearer unit, with the floppy
behind. Note the three broad ribbon
cables which connect to the computer.
VARTRACE lists lines as executed plus variables
VTAPE true Vision load plus APPENDING
TOOLKIT 2 FOR TRS80 I
MC a full machine code monitor
BLANK removes unwanted spaces and LET statements
RENUMBER operates from any start in any increment
ABBREV 26 BASIC words become single -key entries
TRACE see line contents as executed
VARS gives a list of variables on screen
powerful BASIC
and a machine code monitor which greatly enhance an already
TOOLKIT 2 features 17 new easy -to -remember command words
modes. Price CASSETTE £33.95 DISK/FLOPPY TAPE £37.95
cope with the Centronics 737/9 and Tandy proportional spacing
Please state machine type and printer when ordering. W4W can
AND DEVELOPED BY PREMIFR WITH THE HOBBYIST AND
comparable to most purpose-built system. COMMISSIONED
several pages to do justice to this superb product. W4W is
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WORD4WORD PLUS
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TEXT FORMATTING TO SCREEN OR PRINTER
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VISION LOAD OF STORED TEXT
STANDARD LETTER ROUTINES
OVERTYPE CORRECTION. WORD COUNTER
SINGLE KEY WORD DELETION
PAGE LAYOUT & NUMBERING
TOTAL PRINTER CONTROL
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TEXT BLOCK MANIPULATION
COMPREHENSIVE TAB & TABLE GENERATION
HEADER & FOOTERS

Many other features are included in W4W. We would need
several pages to do justice to this superb product. W4W is
comparable to most purpose-built system. COMMISSIONED
and DEVELOPED BY PREMIFR WITH THE HOBBYIST AND
SMALL BUSINESSMAN IN MIND. 5K MIC PROGRAM
Please state machine type and printer when ordering. W4W can
cope with the Centronics 737/9 and Tandy proportional spacing
modes. Price CASSETTE £33.95 DISK/FLOPPY TAPE £37.95

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TOOLKIT 2 features 17 new easy-to-remember command words
and a machine code monitor which greatly enhance an already
powerful BASIC
REPLACE replace any string, word or variable
VARS gives a list of variables on screen
TRACE see line contents as executed
ABBREVIATE BASIC words become single -key entries
RENUMBER operates from any start in any increment
BLANK removes unwanted spaces and LET statements
VTAPE true Vision load plus APPENDING
MC a full machine code monitor
VARTRACE lists lines as executed plus variables

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now use the EPSON MX80F/T, a superb printer which is the world’s best selling printer. The WORD4WORD supplied makes full use
of the features of this printer, and gives true right justification, whether the text is a letter of a series of columns. All disk-based
packages are supplied with DOSPLUS.

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WP2 W4W + GENIE II + MX80F/T PRINTER + all cables £324.95
WP3 W4W + 48K GENIE + 40 track disk drive + DOSPLUS + MX80F/T Printer £1995.00
WP4 as WP3, but twin drives £1449
WP5 as W4W, but with twin double density disk system £92.00 inc

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*The T/Printer 35 costs £475 with Centronics compatible parallel interface. With RS-232C interface it costs £535. Prices listed are exclusive of VAT.
Word processing is just one of many tasks we expect micros to perform now that they have become virtually universal. But word processing is special: this particular use of micros demands something more than the applications package or program genera-

tor. The word processing micro has to imitate the obsolete machine it is oust-
ing — the typewriter — while still being an intelligent terminal or stand-alone computer.

Scirpis 2.0 is the latest version of the standard word processing package for the Tandy TRS-80 and, as such, com-

bines the benefit of powerful compu-
ting resources with the drawback of hardware designed also to be used by the programmer.

This test was done on a TRS-80 Model II which includes one 8in floppy disk drive, in addition to which I used a disk extension unit containing two more drives, although this is not essen-
tial to run Scirpis. Scirpis comes on its own disk, which also contains a copy of the operating system and space for creating documents.

On loading the Scirpis disk and inputting the appropriate date and time, the Scirpis directory is displayed. Pay due respect to the directory as it tells you a lot about the state of your disk and is very much the focal point of the system. It also appears on completing a utility or exiting from a document. The word processing micro has to imitate the obsolete machine it is oust-
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ments at a time from the disk and you can scroll through to find the rest. The sort of details given include a brief des-
cription of content as entered by the user on each header, dates when the document was created and revised and the amount of space it occupies on the disk, with an 'efficiency figure' relating to how many times the document was used.

The open document menu includes information identifying the document and specifying how many lines you want on a page. It displays updated figures on size and usage of the docu-
ment. The 'create new document' menu also lets you state whether you want a vertical document with margins any-
where between columns 1 and 96, or a horizontal document with margins between columns 1 and 156. You tab through pressing 'enter' if you are changing the responses and 'escape' if you are not.

As soon as you've made it through the menu, a clean screen leaps into vision. At the bottom of the screen is the 'format line' and below that a status line which reminds you what page, row and column you are on. At this point, you can set up your special formats if you like, although at any stage within a document you can jump the cursor into the format line and alter margins, paragraph indent or tab settings. One very useful feature when inputting text

is the ability to go into 'full video' mode, press CTRL and V, and have all the document's internal format com-
mands displayed on the screen. This lets you see precisely where you have pressed 'enter' for a forced end of line, or 'tab', or simply let the soft wrap-
around take effect.

The wrap-around prevents division of words and puts the whole word onto the beginning of the next line, but it is not perfect. One problem arises if you reach a full stop at the last position on the line. The following two spaces are wrapped around to the beginning of the next line where they look very odd. Of course, they can be edited out later.

On the subject of wrap-around, how-

ever, I did have one inexplicable 'bug' where the system failed and left me with the last letter of the word on the next line. I was building up a column of information on the right-hand half of the page and had margins set at 35 and 70. On typing the word 'advertising' I got 'advertisin' at the end of the first line and 'g' at the beginning of the second. Perhaps the computer was trying to introduce a more vemacular style into my turgid prose, but experi-

ments showed the same thing happened when other words were substituted.

One advantage of using the 'full video' mode when editing is that you can see when the existence of a forced end of line, for example, is preventing text from shuffling back into the shape left from a deletion. But the confusing thing about editing with these format codes in view is that, while ordinary characters can be overtyped on the screen, format commands have to be deleted and then re-entered. Familiarity
probably eliminates this problem, like others on the system.

Inserting and deleting can be done by pressing the keys to the far right of the keyboard marked F1 and F2 respectively, presumably so named on account of their function for the programmer since the audience has no obvious reference for the average typer. If you want to delete volumes of text you can use the CTRL-D command which lets you define areas of text in words, sentences and larger blocks. However, there is the absence of the vertical margin which determines the position to which the cursor will return after any forced end of line. The left margin can be to the right of the outline marker if you want the first line of each paragraph indented, and left of the left margin if you want paragraphs to start to the left of the rest of the text.

There are three different types of tab, a fact which seems unnecessary at first, but they do all perform discrete functions. Apart from the ordinary use of tab, you can also have aligning around a decimal point which is useful if you have columns of figures that run beyond the decimal point. By typing tab marker '8' you have the option of either function with the same tab marker.

**Printing**

Whenever you try to print a document you will be presented with a print document menu. Apart from specifying precisely which pages you want to print, it also offers you another chance to affect the appearance of the text on the page. Options given include defining the column position for the left side of the text input mode and there is the 'outline' menu. Apart from specifying pre-existing codes within the text as you type, get an underline, for example, you input the underline code at the beginning and end of the text you wish to be affected and similarly for to text to be printed in bold. One obliging code allows you to input notes to yourself which will appear on the screen but will not be printed. However, a problem with these codes is that they involve two distinct operations, first pressing 'escape' to get out of the straightforward text input mode and then pressing the tab shift key in combination with another key to input the command. This can be very laborious if you are writing something which needs lots of words underlined or in bold, and a shortcut I used was the search string utility. This allows you to choose your own shorthand, 'XXX' for example, and at the end of the piece change every occurrence to, say 'XXX' for user-friendly micros'. The search string facility gives you the option of stopping as each string is found and checking that you want it to be deleted or replaced.

An apparent inconsistency means that the system ignores a single underlined space at the beginning of a line, which might later have something filled in by hand. The printer will simply not print unless you take the precaution of using the 'required space' command (ESC pressed with space bar). The same goes for the end of a line when the text is being right justified.

A gaping hole in the print facilities, however, is the absence of the vertical line. In fact it's there on the printwheel and a sufficiently dedicated user could work out the routine for using it, but there is absolutely no reference in the manual to the vertical line. This seems to ignore the need to put text in columns or boxes and offers no easy-to-use facility to draw lines round things on the screen.

There are commands for a wide range of diacritic marks, superscripts and subscripts.

The second method of affecting the final printed copy is by use of the format line which, unlike the print codes, allows you to see on the screen the effect of your format commands.
SCRIPSIT 2.0

text with different `variable' information in each case. Although this facility is most obviously useful to the small businessman who can generate much more effective mailshots by addressing them to named individuals, there are applications for the hobbyist. One example is the production of letters that you may write regularly: 'Dear Mr Shilling', please transfer a pound from your deposit account to my current account... where X might be any one of a number of predefined sums. You can also create a base document which contains the information, such as names of lists and addresses.

In this case, all the base document contains is a set of identifiers for each piece of information: name, number of house, road, town county, postcode. Printing commands as to where the address should appear on the envelope can also be stored. When the files are then merged you get individualised envelopes generated.

### Spelling and hyphenation

Dictionaries against which spellings can be checked are becoming a standard feature in word processing packages and are available from companies like IBM and ICL. They also include the facility for the user to include a list of specialist words that are likely to crop up frequently in his own writing. This facility is provided on Scripsit which allows the user to add up to 2047 words of his own to the dictionary's 100,000 words. The dictionary is somewhat complicated to use since you are emphatically ordered first to make your own copy of the dictionary onto a backup disk. Then, as with the global search and replace facility, you have the option to stop and check over each correction that the dictionary wants to make. The capacity of the dictionary is huge; it can contain up to 1500 misspellings in one go which ought to be enough even for near-illiterates. It also deals with the hyphenation of words.

One of the criticisms of the processing power of Scripsit is that there is no simple arithmetic function. It is quite possible to list columns of numbers but there is no option to run the cursor down them and reach a total at the bottom. Given that this function is easily performed by the lightest of calculators these days, it seems an unnecessary omission from the all-singing, all-dancing word processor. Tools to perform simple mathematical functions have already proved to have great utility. Scripsit already handles numbers dextrously with its facility for aligning columns of figures around the decimal point.

### Documentation

Since the version of Scripsit that I tested was still very new, there was no completed documentation available. However, my criticism of the prototype training manual is that the order of introducing the new procedures manual is extraordinary. The method is to direct the reader to perform certain exercises which draw on lessons of the ensuing chapter. It is easy enough to find out how to do the exercises by reading ahead but this tends to under- mine the point of running through the manual step-by-step. The reference manual deals with all the same procedures in a much more compact form but its index could prove unhelpful to the non-programmer. The expert user will be competent in computer jargon to know which words to look up for a solution to your problem. Words like merge, define, format and scroll.

The `help' facility could be useful here although it is not particularly readable on the screen, amounting to a single line entry for all commands that can be entered under Scripsit, and appears as screens full of text. 'Help' could save you bothering with the manual over a simple command you have forgotten, but is not useful in explaining peculiar error messages on the screen or the apparent impossibility of entering a character where you want to put it.

### Good and bad points

The most obvious irritation with Scripsit is the flashing cursor. Although word processing ought to require the user to look at the screen much, apart from when editing, the flashing cursor is most unpleasant. However, the method of highlighting text to be deleted or moved elsewhere is very effective and puts all the text concerned very clearly into reverse display.

I also found it laborious that the keys didn't automatically repeat when held down, although this facility can be awkward if you're not used to it. Cursor movement up and down the screen requires holding down the `repeat' key at the same time as the `arrow' key or the use of `hold' to move directly to the top, bottom or either side of the screen. An automatic repeat on arrows would be particularly useful.

There are also no arrows to move the cursor diagonally across the screen. Also, the end of the page isn't marked on the screen, so unless you keep a sharp pencil at hand your sentences and paragraphs will be split in odd places from one page to the next.

Another straightforward facility which would be nice to be able to alter upper case to lower case with a single key and vice versa. This would avoid the need to re-type headlines which you subsequently decided should be in upper case, for example. The `convert-case' key could also be an automatic repeat if held down.

Where pieces of text that you want to alter do not fit neatly into words, sentences, or paragraphs it would also be nice to have a facility to let you run the cursor through the particular phrase or one-and-a-half paragraphs you want deleted.

There are some characters which cannot be printed without special user intervention. The keyboard contains no `£' sign and, by default, the printer makes the numeral 1 'lower case' i.e. the same character, of old-fashioned typhewriters.

### Attractive features of the system

You can make an individual document as big as you like up to the capacity of the disk. The 8in high-density disks have a capacity of over half a megabyte (509,184 bytes, to be exact). Tandy claims that it would take a 70-words per-minute typist 24 hours of typing at speed to fill an 8in disk.

Another plus is that you can work on one document and simultaneously print another without getting any significant degradation on the system. Of course there are some special functions, such as formatting a disk or merging or copying documents, which you cannot do in this mode.

The need to back up documents created every day is made easier by means of the 'back-up' utility which copies disks wholesale at the end of the day at ten minutes a time.

### Summary

Scripsit is a word processing package on the sort of micro that you would expect to find in a small business or educational environment. In both situations the user might be expected to be familiar with the rudiments of computing and, given that background, I would expect him to find Scripsit an exciting tool. For example, the dual function of the keyboard means it is often necessary to hold down two keys simultaneously to perform functions. Scripsit is very versatile but could be off-putting to the non-programmer.

Of the PCW 'standard users', I would expect the author/journalist to find this system a little over-complex. He/she wants a system that is relatively cheap and easy to use. He has no great need of sophisticated formatting facilities. However, he would benefit from the speed with which you can move around in the text and from the repaginate and numbering facilities. And he/she might find the dictionary very useful for proof checking.

The technical/ managerial report writer might bemoan the lack of simple maths functions but would appreciate the extensive facilities for formatting, printing and making global alterations. Scripsit could also employ the user-defined areas of the dictionary for specialist words relating to their own subjects. However, they might regret the lack of a vertical line or graphics capability.

The manager might find that there is insufficient time to learn the wide range of functions that the system could perform.

The secretary, once familiar with the machine, should be able to make extensive use of it and find the dictionary useful.

### Benchmark timings

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Time (seconds)</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>(na)</td>
</tr>
<tr>
<td>2</td>
<td>(na)</td>
</tr>
<tr>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>4</td>
<td>1.0</td>
</tr>
<tr>
<td>5</td>
<td>32.0</td>
</tr>
<tr>
<td>6</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Printer (Tandy daisywheel): 37.4 cps All times in seconds.
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In the three months since I bought Lexisoft's Spellbinder word processing system, I've written several lengthy reports and seen a couple of lengthy reports and created a named address file. So the system has been well exercised and, with just a couple of exceptions, I have been delighted with it. I am still discovering new features and functions which more than match my growing needs. Anyone at all serious about buying a CP/M-based word processing system should consider Spellbinder among their options.

Lexisoft describes Spellbinder as a 'Word Processing and Office Management system' — an interesting description because it's certainly more than a word processor, but how do you define office management? When I read Lexisoft's disclaimer that it 'makes no representation with respect to the fitness of the product for any particular purpose', I really wondered what I'd let myself in for. Still, the company has clearly gone to a lot of trouble in preparing the excellent manual and even used Spellbinder to produce it!

The package can be considered in two parts: word processing and - yes, why not? - office management. The word processing functions allow you to enter and manipulate text, store it on disk and print it out. The office management programs — some of which are provided, others you can program yourself — allow you to perform jobs such as sorting records, extracting and merging information from different files and printing text in multiple columns. These programs are called macros and they're written in a language called M-Speak. A typical program would be one which allows you to personalise a standard document by incorporating previously filled information about the recipient.

That's the overview. Since I quite like the structure of Lexisoft's manual, I shall follow the same sequence. This will introduce you to things in a sensible order and you'll also give you a feel for the sort of documentation you'll get.

System operation
The introductory section explains how the manual should be used, describes Spellbinder's highlights and tells you how to tailor the package to suit your requirements. A further section describes how to set up Spellbinder to suit your system configuration. This last task should be performed by your dealer unless you are already experienced in the ways of computers. I run my version of Spellbinder on a SuperBrain connected to an Epson MX 80 F/T printer. Although this denies me a few of Spellbinder's smarter options, such as proportional letter spacing and underlining, I consider this configuration to be almost ideal for a writer. Clearly, most types of office work would demand a better quality print but this isn't a criticism of the Epson, which does its job very well. My system is configured so that I can use SuperBrain's numeric keypad as a set of function keys. Some users will have to use various letters in conjunction with the control key to achieve the same results.

The manual contains a pull-out, bound section called 'Spellbinding Made Easy' which, although it doesn't cover all the features and functions of Spellbinder, certainly gives the beginner enough information to start word processing in earnest. Edit mode is explained first, in which you can create, insert, change and delete text. Cursor control is provided, on the SuperBrain at least, by the normal arrowed keys. One key allows you to change between various 'cursor modes' — character, word, sentence and paragraph. This relates to the amount of text to be regarded as a single unit when skipping forwards and backwards or deleting using the three appropriate function keys. The mode chosen is permanently displayed at the top of the screen next to the current line and column numbers which tell you exactly where you are in the text. I find it best to stay in 'word' mode since it is quite easy to forget to check the mode before deleting. It's a mite inconvenient when you lose a carefully crafted paragraph by mistake! The very handy function key allows you to move the cursor to the beginning or end of the current line. A character delete key allows you to delete one character at a time regardless of cursor mode and an insert key opens up the text to allow you to enter extra material. A touch on the same key closes the text up again following insertion.

Command mode allows you to make major changes to text, print it and move it to and from disk. The word COMMAND is displayed at the top of the screen in place of the word EDIT. If you try to issue a command while you're in edit mode, then the command simply gets incorporated in your text. If you try to edit while in command mode then the outcome rather depends on whether you accidentally type a valid command. Most of the time, the system will regard your attempted command as gibberish and tell you so. A single key switches you between the two modes. On my 64k SuperBrain, I have room to enter 33894 characters before needing to save some to disk. If you need to find out how much room is left in this buffer command, 'm' does the trick. Right now I've got 28636 letters left to go. Cursor movement commands allow you to move the cursor to the beginning or end of text (beginning could be for printing or saving to disk and end for adding new text) or forward and backwards 'n' lines. For example, b5 will take the cursor back five lines. Two delete commands (d and da) allow you to delete all or part of the text. If you attempt to delete more than 1024 characters, Spellbinder gets suspicious and asks the question REALLY? at the top of the screen. Anything but a Y (for 'yes') will abandon the command. There are plenty of other commands but, for now, we'll move on to disk operations.

The four main disk activities are saving text, deleting files, reading files and asking for a disk directory (a list of all the files on a particular disk). Once
again, the commands are pretty simple — to obtain a directory, type the letter q (for 'query' perhaps?) followed by the letter of the disk drive. Up to seven drives can be handled and they would be lettered from A to G. A listing appears on the screen of all the file names and the space each occupies, followed by the total amount of disk storage used to date. The command 'w' causes text to be written to disk and 'wd' allows the disk file to be closed down, so the most usual way of saving text is to type 'wd'. This takes care of a single command to save just a part of the text by specifying the number of lines from the current cursor position. After issuing the first 'w' command, Spellbinder asks you to name the file to which the text is to be saved. If the file already exists, the system automatically renames the existing file and creates a new one. The renamed file can then be used as a back-up in case anything goes wrong with the new file.

During the course of writing an article, I frequently write the text to disk using a 'v' command and its variants. It is possible to delete a file from disk. To read a file in, the file, say SPELL.BAK, is restored back to the system. Any existing SPELL, the previous version is renamed SPELL.BAK by the system. Any existing file, having the same name every time. For example, during the course of writing an article, it is possible to lose on occasion a successful save. The 'qd' command followed by a file name allows you to delete a file from disk. To read a file in, simply type 'r' followed by the file name.

Printing is accomplished with the 'p' command and its variants. It is possible to fool the system into sending text to the printer at the end of the print line by using a 'v' (view) instruction. This is very useful for checking that everything is laid out properly before actually committing your work to paper. I find that unless you use this facility, you are almost certain to get the odd heading printed at the foot of a page with its text printed on the following page. Or you may find words here and there that you prefer to hyphenate at the end of line. For anyone concerned with obtaining the best possible result first time, the 'v' command is invaluable. The layout of a page is dictated by two tables which can be modified using command or edit facilities. One table allows you to define page titles, numbering and spacing at the head and foot of the page, while the other table enables you to define things like the page layout and character treatment. In my case, there wasn't a lot I could do with the characters using the table since I don't have proportional spacing or underlining facilities. I do get round this problem to a certain extent, though, by using the control characters direct to the printer — more about this later on. However, I can easily define the other variables like right justification, lines per page, carriage returns per line, and indentations. Things can be centred, and non-printing remarks and forced page-ends are all possible using some of the 'dot commands' mentioned above. These are single letter commands which you can place at the beginning of a line and, not surprisingly perhaps, each is preceded by a full stop (dot).

**Further facilities**

Having dealt with the essential functions, we'll now move on to some of the more esoteric facilities. The first (did I say esoteric?) is the repeat key on my system I use the decimal point on the numeric keypad. Other users might have to use CTRL-R. To start the repeat, hit the repeat key followed by the character to be repeated; to stop it, hit the repeat key again. One more depression of the repeat key restarts the repeat and so on. To discontinue the repeat function, just hit any key other than the one being repeated. More exciting perhaps is the 'hold' function which allows you to tuck sections of text away into a 'hold buffer' then 'unhold' it anywhere else in the text. I use this facility to shift paragraphs around to give my text a better sequence. 'ho' empties the hold buffer and prepares it for a fresh hold command.

Other features covered by the introductory text are tab setting, relining, hyphens, marks, character enhancement and indenting. Tabs can be set at regular intervals by a single command or individually by separate commands. Normally the screen 'wraps around' after 80 characters, taking any half-finished words on to the next line. Reline allows you to redefine the screen width as anything from 16 to 159 characters. The wider screen allows you to set up information in tabular form, for example. As the cursor reaches the 81st character position, the right-hand side of the 'screen' becomes visible. Hyphens come in two varieties: the normal (hard) hyphen which appears as part of the printed text and another, called the soft hyphen, which only comes into play if the word containing it happens to occur at the beginning of a line. If this happens, then Spellbinder will try to print the word up to and including the hyphen at the end of the previous line. This can be useful when a particularly long word causes a large end-of-line gap or weird proportional spacing. Marks are exactly this; they are used to arrest the progress of certain commands. For example, it is possible to hold or delete text up to a mark, or you might want to skip forwards or backwards to a marked spot in the text. I use it most for holding text when I'm doing one of my many reshuffling exercises. Those with flashy printers will be pleased to hear about the various ways of enhancing text. By using a special character at the beginning and end of the area to be treated, you can underline, boldface, shadow print, slash over, strike (goodness knows why) or dash overstrike (ditto). There are other options but these are the main ones covered in the 'Made Easy' book. Finally, indentation refines the position of the left-hand edge of text. It is...
superior to tabbing because it doesn't fill the unprinted area with spaces. This has the added advantage that if you open or close up the text as the text is opened or closed up, the indent are without affecting the indent area. The same thing in tabbed text would most likely result in the indent moving as the text is opened or closed up. The indent is achieved by pressing just one key and, each time you press it, the indent moves next to the cursor position. Just taking all the text from the cursor position in the current paragraph along with it. I found this feature ideal when I was drawing up a draft constitution for Concorde. The second major type of command appear in this section — commands which allow you to enter and execute the macro programs mentioned earlier, others which perform work on text which is bigger than the computer's available memory and others which allow you to search through text for specific character strings and replace them if you want to. User messages are listed, together with a full explanation of each and, where appropriate, tips on how to proceed. The table entries relate to the second type of command.

The general reference section covers much the same ground as the quick reference, but with much more explanation. I'm not going into the reasons why things are the way they are. I found this most useful once I'd got over the initial shock of having to learn so much in order to master the package. The section is ideal for those who have got the hang of Spellbinder and who now want to ferret out its innermost secrets. One of the first new things you learn about is that you can make a fair chance of recovering text which you think is still in the computer's memory. Now and again something will go wrong, but it's a finger trace down the machine fault or a bug in the software, and you'll find yourself sitting outside Spellbinder, probably back in CP/M, just when you least expect it. The answer is to answer Y to the question OLD FILE? which appears as you enter the package. If it's at all possible to recover the text file, Spellbinder will do it. And just in case you're wondering, the only times that this has happened to me is when my machine has gone wrong or when I've tried to access a non-existent disk drive. (What am I saying? Is it possible to access a non-existent disk drive.)

There's nothing to stop you sprinkling different tables at different points in the text. Another interesting effect is that odd or even (if you're wondering what's good about that), look where the PCW page numbers are) and the space between pages can be defined at various places in the text — a very flexible arrangement indeed. If you're writing a book and you write a chapter or two at a time, you can set the page numbers as ascending order by specifying the starting page number before printing. Once again, you can even redefine it as you go along.

For those who are interested in printing options and I only wish I had a nice daisywheel printer to try them out. Here we go with the output not machine specific. Dual shift and upshift allow you to print subscripts and superscripts. A couple of weirdos called firm hyphen and line tweaker allow you to space lines out and create boldface space instead of character. Spellbinder probably back in CP/M, just when you least expect it. The answer is to answer Y to the question OLD FILE? which appears as you enter the package. If it's at all possible to recover the text file, Spellbinder will do it. And just in case you're wondering, the only times that this has happened to me is when my machine has gone wrong or when I've tried to access a non-existent disk drive. (What am I saying? Is it possible to access a non-existent disk drive.)

Three types of search are described: simple, discretionary search/replace and automatic search/replace. The first will place the cursor on the first occurrence of the string being searched. That's provided that you put the cursor at the top of text before starting. Searching always operates from the current paragraph. Discretionary search and replace gives you the choice of replacing each occurrence of the searched text with a new text, whereas the third option automatically replaces the string with a new string. 'Wildcards' are question marks embedded in the text and allow any character to satisfy the search. For example, the string 'Quick Brown fox' would be found by both 'Quick Brown fox' and 'Quick Brown f*'.

For those new to the system, it is possible to display a user guide on the bottom eight lines of the screen. This gives the operator a quick reference to the various features and what keys access them. I certainly found this useful for the first couple of days. Once I'd got used to the keys, I removed the user guide followed by rebuilding the word 'Microwriter' 50 times. To save time, I entered the abbreviation 'M*' and when the keying was complete I entered an automatic search and replace command to exchange Microwriter for M*.

Sometimes you might use a sequence of commands over and over again. It is possible to carry out these sequences automatically. I often use this feature to print several copies of the same document. By embedding a form advance dot command at the end of a document, you can tell the printer to print a 'n' copies. By issuing the command 'n/p/t' the 'n' is the number of copies, the 'p' says I want to print text from memory and the 't' says I want to return the cursor to the top of the text before printing. Almost all commands may be strung together in this way. An 'l' in the command string would allow the operator to inspect the internal execution of the instructions preceding it. It's possible to switch between two alternative print formats. This is useful if you change stationery regularly between, say, letters and memos. You can, if you prefer (and I do), build print formats into the text using our old friends the dot commands. This means that whenever you print a particular document you can be sure that the correct tables are in operation.
ment. This would be useful in a variety of situations; one that springs to mind is when creating a contract because you tend to use the same phrases over and over again. Another macro allows you to define a batch of files to be printed and it gets on with the job unattended. Nice if you want to watch a good program on the television. Beware of printer wrecks, though.

Two-column printing is done with a standard macro and three sorts are provided, two of which work with standard format name and address records. These are fine if you want to conform to Lexsoft's idea of a name and address file. The other sort works on any field of any record and sorts the records alphabetically — very useful. I feel, very slow too. Finally, a mail merge macro enables you to personalise letters by extracting relevant bits from the standard name and address file and incorporating them in your standard letter.

For those who'd like to edit CP/M assembler, MAC or any of the CP/M Basic files, you'll be pleased to hear that special read and write commands exist to ensure compatibility between the two formats.

**M-speak**

The final section of the manual introduces M-Speak programming so that you can have a bash at creating your own macros. Programs are entered using Spellbinder's edit mode. The M-Speak commands include virtually all the command mode instructions plus a number of special M-Speak commands which I'll come on to in a minute. The macros are manipulated and executed from command mode by a set of four instructions: move macro to or from the macro buffer, execute the macro one instruction at a time, and go from command mode by a set of four commands: move macro to or from the macro buffer, execute the macro one instruction at a time, and go from command mode by a set of four commands. The macros can be created using Spellbinder's edit mode. The M-Speak commands include

- Special read and write commands exist for assembler, MAC or any of the CP/M Basic, assembler, MAC or any of the CP/M Basic files, you'll be pleased to hear that special read and write commands exist to ensure compatibility between the two formats.

**Who'd use it?**

Now you know more about Spellbinder than I did after using it for a couple of months.

I think that this package has something to offer all user categories. The writer, of course, will find it a joy to use, it will probably do just about everything he needs. The most significant omission as far as I'm concerned is that it doesn't give a word count. Since we work out the layout of PCW, and pay people according to word count, I consider this omission to be significant! I'm sure that I could knock up a little macro to do it but it would be far more convenient to have a built-in function.

I suppose, while I'm at it, I should bid for an indexing function as well — this would be especially useful to a text book author. And yes, let's go the whole hog — although I'll never need it (lies — Sub Ed) — why not a spelling corrector built-in as well? The package probably has more than the average manager will ever use, unless he's mad keen on doing his own reports, but his secretary will love it. The fact that the entire package sits in memory allowing you to switch from edit mode to command mode at will makes life very easy compared with some other packages and, on my SuperBrain at least, I can plough on for hours before I start to fill up memory. Let's see now, ah yes — I've still got 7683 characters left to go before I need to worry about popping some of this evaluation on to disk. The fact that the package can run with any printer, from the Sanders through daisywheels to cheapo dot-matrix machines, means that whoever you are and whatever kit you've got, providing you don't mind spending £250 + VAT, Spellbinder has plenty to offer you.

As far as I can tell, Spellbinder has one bug and one fault. The bug is that it is possible, under certain (and rare) circumstances, to create an enormous gap in your text which defies most attempts to get rid of it. It usually happens in insert mode when you're messing around with cursor controls. There are two ways of baling out from this. One is to put a mark on the last line of the gap and to use the delete command (this doesn't always work), the other involves writing the text to disk and reading it back in again. The fault is that the system configuration should include an option to define the number of disk drives being used so that if you enter an invalid drive letter you at least get stopped by Spellbinder and not by CP/M.

Overall, I reckon that Spellbinder is excellent and not at all bad value for money.

The timings which follow reflect the performance of the hardware configuration in conjunction with Spellbinder, rather than giving any absolute measure of the word-processor's performance. The first set of timings relate to a 3000-word text containing 50 occurrences of a word to be replaced. The entire text is held in the memory of the machine.

1. Read from disk 
2. Write to disk 
3. Jump from start to end 
4. Jump from end to start 
5. Replace QQQQQ with Microwriter 
6. Replace Microwriter with QQQQQ

The next two timings are for a 6000-word text containing 100 occurrences of the word to be replaced. Since some of the text overflows the available memory area, this has to be called in from disk during the search and replace operation. The entire text is written to a new file on disk. The timing includes 100 replacements, writing the entire text to a new file and reading in the overview.

To print the original 3000-word test text on the Epson MX 80 P/T took 6m 44s. This included headings, right justification, a left margin and an extra line feed between each paragraph.
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Tel: (0494) 23804.
It was always a little difficult to take
the original Commodore PET totally
seriously. Name apart, it had several
drawbacks as a business machine, even
after it was given a proper keyboard: in
particular, its 40-column screen width
was limiting, especially for word
processing, the application in which we're
interested here.

Commodore, too, realised that a
'serious' PET was needed and produced
the 8000 series, with a larger screen
holding 80 characters per line; this,
amongst other features, made the 'Super-
PET' more suited to business use.

Software houses have responded by
producing an ever-growing range of
applications packages for the 8000
series, including several word
processing packages.

This review is of the Wordpro 4 Plus
package, produced by Pro-Micro Soft-
ware Ltd and marketed by Professional
Software. The package was tested on an
8032 computer with the 2040 twin
mini-floppy disk drive unit and a Diablo
630 daisywheel printer.

Wordpro 4 Plus comes on a disk (for-
manned for 2040, 3040, 4040 and 8050
drives), a ROM which fits into one of
the spare sockets to ensure that it's
put in the right one -- and it can stay in
place while the machine is being used
for other applications.

Editorial

Wordpro 4 Plus is an all-in-one package,
which means you can edit text and print
it without having to first save it to disk
and run a formatting program. This is
convenient, but it eats up memory
space, as we'll see in a moment.

With the ROM installed, you load the
program from Basic and run it by typing
RUN. The loading was not always fool-
proof and occasionally I had to abort it
and jiggle the disk around in the drive
before starting again; the manual warns
you about this.

You're then asked a series of ques-
tions to set up various system para-
eters, such as the size of text buffer
required and the type of printer being
used (see photo); WP4+ has built-in
drivers for any CBM printer, the NEC
Spinwriter, Diablo 630, Qume Sprint 5,
TEC 1500 and any other suitable
printer which can be interfaced to the
SuperPET. With the questions answered,
you're into the program proper, which,
initially, gives a blank screen with a
status line across the top; this tells you
what control mode you're in, prompts
you when you're doing things like
saving to disk, and shows the current
cursor position as line and column
numbers.

There's no need to hit return at the
end of each line as you type unless you
want to force a return -- at the end of a
paragraph, for instance; return is shown
as a small arrow symbol on the screen.

But WP4+ does not have auto word
wrap-around, in which, if you're half-
way through a word when you reach
the end of the line, the whole of the
word is automatically transferred to the
start of the next line. The result (of not
having wrap-around) is that the text is
just that little bit more difficult to read
as words are split randomly at the end
of lines.

Control functions are activated by
pressing the RVS key followed by the
key corresponding to the desired com-
mand -- using the stick-on labels makes
this quite easy.

Cursor movement is by the Super-
PET's normal cursor keys. If you're not
familiar with a Commodore keyboard,
this is a little inconvenient at first; there
are only two cursor keys and upwards
and right-to-left movements are ob-
tained by shifting the keys. Nearly all
the keys have an auto repeat action
which functions if the key is held down
for more than a second or so. The
cursor can be homed to the top left-
hand corner of the current page or text
file but the only way to get to the
bottom of text is by scrolling right
through it with the cursor down key. A
'go to line n' command is available, useful
if you have a standard text
requiring minor alterations at a known
line before printing. It's also possible to
insert comments which won't appear in
the printed text.

Tabs are set by positioning the cursor
on the line and pressing a control key;
the only way to get these after scrolling
(right-to-left) is to use the machine's tab
key.

Insertion and deletion operate on
words, sentences and lines, and are
straightforward to use. Erasing works
on all the text, specific lines or on all
text following the current cursor
position.

Blocks of text can be moved by first
specifying which lines you're interested
in — a very easy process — and then positioning the cursor at the required destination. Pressing a transfer control key then moves the lines and deletes them from their original position. This function works on entire screen lines, however, not on complete sentences.

Commands are available to find occurrences of strings and to search and replace strings; the latter is quite good fun as the replacing happens on the screen before your very eyes, although this must slow down the process considerably.

Wordpro 4 Plus gives the user two text buffers, one called main and the other called extra. Together they can handle a total of 139 lines, of which a maximum of 116 can be allocated to the main, working buffer. This limits the size of any piece of text to 9250 characters (1325 words or just under three single-spaced A4 pages).

The extra text buffer can be as large as 69 lines (5520 characters) and is designed for reading in material from a separate file for incorporation into the text in the main buffer. An easy-to-use variable function enables you to set up a standard letter in the main buffer, load a file of names and addresses into the extra buffer and automatically produce customised letters. The facility is by no means as powerful as that of Magic Wand, reviewed last month, and the maximum size limit of the extra buffer prevents you from holding a big mailing list, but for low to medium volume work it's a foolproof and simple system. Similar operations can be performed using paragraphs of text held in the extra buffer.

At first sight the 116 lines main text buffer limit may appear to be a severe handicap. However, it is possible to handle lengthy texts by splitting them into separate files.

Having entered your set of text files, you can then print them using a global printing command, by means of which the system will automatically start to print the next file as soon as it reaches the end of the first. Search and replace can also function globally, which is extremely useful.

Because of the 116 lines limit, it was not possible to carry out the full range of WP Benchmarks; in fact, only the two search and replace and the printer tests could be made, using the global facility, with the stopwatch stopped when the system paused to read in the next file from disk.

The final function which deserves special mention is the numeric tabbing facility provided by WP4+. This enables you to enter columns of figures and line up the decimal points — it works to two decimal places and is designed mainly for accounting. Further, the system will automatically add up or subtract the columns for you.

Disk handling is very straightforward, both for reading and writing (called recalling and memorising in the manual). It is possible to view the directories directly from WP4+, although doing so destroys whatever's in the text buffer at the time, which can be unfortunate if you wanted to see if there was enough space on a disk to save the text you'd just typed in! Various disk utilities are built into WP4+ including formatting blank disks, disk validation (which removes 'bad' areas of the disk from use, as the manual puts it), duplicating an entire disk, copying files either singly or in a linked group using a global command, and renaming and characterising files.

Total disk capacity with the 2040 drives is 170 kbytes, which works out at about 54 single-spaced A4 pages, split across several files, of course.

In summary, the editing side of WP4+ has been well designed around the SuperPET's facilities, is easy to learn and use and provides some useful capabilities for the general business user.

**Formatting**

Wordpro 4 Plus gives a good range of formatting capabilities, achieved by embedding commands in the text. The commands are denoted by a versus mark on the screen and several commands can be placed on one line, separated by a colon, although a few must be placed at the end of a command line.

WP4+ checks the command syntax during output; if it encounters an error it stops printing with the cursor positioned on the error and a 'syntax error' message is displayed on the status line.

You are given control over both margins, overall page length, number of lines per page, and line spacing (single, double or triple). Text can be justified or printed with either the left or right margin aligned and the other left ragged and there's also provision for 'outdenting' lines. Lines can also be centred between margins. There's a command to insert n blank lines in the text to leave room for a diagram and you can specify a line at which printing is to start on a page, both of which eliminate the need to insert multiple returns in the text, which would waste lines in the text buffer. You can force a page feed, either immediately or if fewer than a specified number of lines remain on the page. Ghost hyphenation is also catered for.

To match its built-in printing drivers, WP4+ provides a good range of printer control commands, catering for boling, underlining, superscripting and subscripting. You can specify horizontal pitch and vertical lines per inch and you can define certain keys to produce codes matching special characters on some daisy-wheels. There's a pause command (to which you can add your own prompt which will appear on the screen) to stop printing should you need to change a daisy-wheel, for example.

Headings and footings can be specified, each occupying a single line at the top or bottom of the page. These lines are split into three 'fields', two aligned with the margins and one centred between them.

WP4+ allows you to preview the formatted text by outputting it to the screen instead of to the printer; this is a very useful way to ensure you've got it exactly right without wasting paper on draft copies. If you spot a mistake you can stop the output; this automatically puts you back into the editing...
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IMPORTERS AND DISTRIBUTORS OF QUALITY MICRO COMPUTER PRODUCTS TO THE TRADE

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KINKAKUJI TEMPLE (Golden Pavilion) KYOTO
mode so that you can correct the error. Printing can be done a page at a
time, to allow you to insert sheets into
the printer, or it can be continuous; it's
possible to print from any page and, as I
mentioned earlier, there's a global com-
mand which will allow you to print a
series of linked files automatically. It's
also possible to send the formatted out-
put to disk and then spool print the text —
this allows you to carry on editing
another document while the first is
being printed.
Like the editing, then, WP4+’s for-
matting is straightforward; there are a
few frills but not enough to make the
system complicated to learn.

Learning and documentation
Wordpro 4 Plus provides a useful range
of functions without being complex. It's
easy to use and learning is not difficult,
though it would be made easier with better
documentation.
The manual is a loose-leaf affair in a
smart ring binder — the initial impression
is good but this is ruined once the
would-be learner opens it and gets stuck in.
The manual covers all aspects of
using WP4+, certainly, but in a loosely
structured and not particularly logical
way. The layout is poor, lacking little
advantage of the form factor, which
WP4+ offers to make such documents
clearer. Take, as an example, the page
on making a back-up copy of the system
master disk; firstly, the layout doesn't appeal
until you wade into the manual and
have already started to learn the system —
it should be one of the first things
explained; second, it’s only when you
get half way down the page that you
discover that the instructions which
you’ve been trying to execute apply
only to the 8050 drives — users with
other devices are suddenly told to turn
a page near the back of the book for
their instructions. This is silly because
the general tone of the manual is aimed
at the complete novice — earlier, several
pages are devoted to switching the
equipment on and off, for example.
The general (but inconsistent) format
is a series of lessons, some of which are
followed by exercises; unfortunately the
exercises sometimes follow exactly the
previous lesson, giving an impression of
repetition which becomes slightly
tedious.
There are other small anomalies, such
as the use of the symbol @ when refer-
ing to the control symbol, which is
confusing as there’s an @ key on the machine which is used for search and
replace.
To be fair, though, the actual ex-
planations of the system’s facilities are
clear and comprehensible and, with
patience, a novice should be able to use
WP4+ without trouble once he/she’s
waded through the manual.

Users
Looking at our four user categories,
then, who’s going to find WP4+ useful?
On the whole, I wouldn’t recommend it
to the author/journalist, mainly
because of its small text buffer and the
consequent need to split text into a
large number of fairly small files. As I
fall into this category myself, I know
how useful it is to be able to look back
at what you wrote pages earlier without
having to save the current text
on disk, load a different text file, look
at it and then reload the part you’re
working on.
The report-writer would find this
less of a limitation, as reports are far
more structured than a piece of creative
writing or a newspaper article. For any-
thing other than the smallest of reports,
he'd also have to split his work into a
number of files but I think this wouldn’t
be too much trouble. The numeric
tabbing feature would make financial
report writing a cinch and the good
formatting capabilities, coupled with a
daisywheel printer, make WP4+ a useful
tool for this user.

Quite how useful the package
would be to a manager depends in this case on
what he manages. A departmental
manager in a big company, with limited
personal WP needs and a secretary to do
the complicated stuff, might find it very
handy for memos but might be deterred
by the modular hardware — trailing
wires don't go well with the executive
image. But if you run a small business, again
with limited WP requirements, would
find WP4+ useful as an addition to other
packages (stock control, etc) needed to
run his business and now available for
the SuperPET.
If the office requirement is for high
volume word processing only, with no need for the SuperPET’s other ca-
pabilities, then I wouldn’t recommend
Wordpro; although the secretary would
feel quite at home with the hardware/
software combination reviewed here,
its limitations would, I feel, make it un-
suitable for large mailing shots of
customised letters, for example, or for
producing long texts.

Hardware
We Benchtested the 8000 series in
September 1980 so I'll confine my
comments to those very suitable for word
processing. Certainly the 80-column screen is pleasant to use; it displays 23
lines of text, as the status line and its
rule take the two at the top, but this is
not a problem. The SuperPET displays
green letters on a black background and
these are very legible; there's a bright-
ness control at the back of the machine
and the characters have true descenders.
The keyboard has a nice solid feel and is
the 2040 disk drives are quiet and
the entire test text within its buffer,
benchmarks 1-4 could not be tested.

Printer test: Diablo 630

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>n/a</td>
</tr>
<tr>
<td>2</td>
<td>n/a</td>
</tr>
<tr>
<td>3</td>
<td>n/a</td>
</tr>
<tr>
<td>4</td>
<td>108.4</td>
</tr>
<tr>
<td>5</td>
<td>n/a</td>
</tr>
<tr>
<td>6</td>
<td>109.1</td>
</tr>
</tbody>
</table>

Note: Because WP4+ cannot store
the absolute speed is required.

Printed text: Diablo 630

Time taken to print out 3000-word
text: 5min 51sec (30 char/sec,
304.5 wpm).

Prices (excluding VAT)

<table>
<thead>
<tr>
<th>Price</th>
<th>Machine</th>
<th>Drive</th>
</tr>
</thead>
<tbody>
<tr>
<td>£395.00</td>
<td>Wordpro 4 Plus</td>
<td>8032 computer</td>
</tr>
<tr>
<td></td>
<td>CBM 2040 disk drives</td>
<td>3040 printer</td>
</tr>
</tbody>
</table>

Fig 1 Diablo 630 typefaces.
64K Dual Density Model
(320K Disk)
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(700K Disk)
only £2150
(or lease for only £12 per week)

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Peter Rodwell tests the 'industry standard' word processing package for CP/M-based systems.

WORDSTAR

Despite the fact that there are now probably nearly two dozen word processing packages available to run on microcomputers of one sort or another, the one you're most likely to come across, to find most frequently in dealers' showrooms and to hear mentioned most often, is the package called WordStar, produced by MicroPro.

WordStar has become the 'industry standard' word processing package and is available not only for just about every CP/M-based micro but for a few others as well, most notably the Apple II (provided the machine has been converted to run under CP/M with a Softcard and an 80-column screen card). There are even one or two dedicated word processors around which have been designed specifically to run WordStar. You can go on training course or two to learn to use WordStar and you can even buy a book (WordStar Made
Easy by Walter A Ettlin, pub Osborne/ McGraw-Hill) which teaches you to use WordStar.

Oddly enough, although WordStar is available just on about every CP/M machine around, it proved somewhat difficult to borrow a micro specifically to test it. Though, The Microcomputers felt it was time we reported on what has been happening to the Transam Tuscan since we Benchtested an early model back in early '81. This test was carried out on the latest Tuscan, a twin-disk, CP/M business machine which, for a refreshing change, is British designed and built. But more on the hardware later — first let's look at WordStar.

Installation

Most WordStar users will buy the package already configured for their particular machine, probably at the same time as they buy the machine. But WordStar is supplied with a program called INSTALL which, if you have a standard WordStar, you run to configure it to your own system, taking advantage of any special features of the computer and/or printer.

In the case of this Benchtest, Transam had preconfigured WordStar on the Tuscan so the procedure wasn't necessary. Having installed WordStar on one or two other systems in the past, though, we can say that it's a very easy procedure provided you have a reasonably standard system. 'Standard' in this case means CP/M, a minimum of 45K of RAM (the more the better) and a terminal or VDU board with at least 16 lines of 40 columns and an addressable cursor (ie. the computer can move the cursor to any position on the screen by sending a special command code followed by the row and column numbers of the position to which the cursor should move). WordStar can in fact operate with just about every terminal (except, damn it, mine!) and can handle up to 120 lines across 250 columns (although it needs lots of RAM to do this — it's very much a theoretical upper limit). WordStar can be installed to take advantage of special VDU characteristics such as character-by-character inverse video or bright/dim characters.

You can run most of WordStar's facilities, including sub and super-scripts, backspacing, ribbon colour change etc. If you have very special requirements and you can write routines to handle them in Z80/8080 machine code, you can 'patch' WordStar to incorporate them. Full details are given in the installation guide, together with assembler source code listings of the relevant parts of WordStar.

One other thing (in computing terms) users should be able to manage a straightforward installation; more advanced users (those with programming experience) and dealers should be able to modify and install WordStar for just about any system currently around. One of the reasons for WordStar's widespread use must lie in the ease with which it can be installed on virtually any given system.

Editing

With WordStar installed, either by the dealer or by the user, the installed version is called up either by typing just its name or by additionally typing the text file name and the disk drive on which it can be found or is to be created. Optionally, you can add another disk drive name after the file-name, indicating the destination for the finished text. So the line: WS A: TEXT. DOC B: would edit the file TEXT DOC on drive A and put the result onto drive B with the same file name.

If no file name is specified, you find yourself looking at the 'No File Menu', a list of commands available plus a directory of the currently active disk. From this menu you can edit a file, either 'in a document' or 'non-document' (ie, a program source listing), change the currently logged-on disk drive, suppress or reactivate the automatic display of the disk directory, print, rename, copy or delete a file, exit WordStar temporarily to run another program and then return to it, or exit completely from WordStar. Additionally, there are special commands to run two programs linked with WordStar, MailMerge, the mailing list handler, and SpellStar, the spelling check program.

There's one command available at this stage which deserves special mention, for it's to do with a feature for which WordStar has justifiably become famous — the 'help level'. WordStar comes with a whole set of 'help' menus which vary according to the operation you're performing at any given moment. Normally, when the system starts up, the help level is set to 3, the most verbose and, er, helpful level; this level can be changed, right down to 0 which suppresses the menus almost entirely so that, as you become more familiar with the package, you can clear space on the screen to display larger amounts of text. Unfortunately, though, there's no way to re-configure WordStar to start at any level other than 3, so you have to set the help level every time you start an editing session if you want a lower level than 3.

Once you have specified a document name, WordStar enters its editing mode automatically, displaying a new menu — this time of the controls used during text input. Also displayed is a ruler at the top of the text area (see Figure 1) showing the left and right margins and the tab stops, denoted by exclamation marks.

Anything typed at the keyboard using the normal alphanumeric keys is, at this stage, considered text and appears in the text area of the screen. Although cursor control keys are now fairly common on microcomputer and terminal keyboards, they are by no means universal and where they do occur, the codes they produce aren't necessarily standardised. To enable WordStar to work on every keyboard, then, its authors have chosen to rely on control characters to move the cursor around through the text and to perform other operations.

The result is, at first sight, a ghostly confusion of control codes which seem to bear no connection with the operation with which they are concerned. For example, you press CTRL-S to move the cursor left one character. CTRL-W to scroll text down by a line. There appears to be no logic behind the choice of control codes and certainly no attempt to make them easy to remember by using more mnemonic codes such as CTRL-L and CTRL-D respectively for the two operations just mentioned. In fact, WordStar is more cunning than this, for the codes chosen for these basic — and frequently used — cursor movements all use keys in a block next to the usual position for the control key, at the far left of the

Fig 1. The main menu at help level 3. Note page break.
keyboard. Thus, while CTRL-S moves the cursor left one character, CTRL-A moves to the word, and CTRL-D moves it right by a character, CTRL-F moves it right by a word. The up and down movements are similarly controlled. There's no need, then, to try to use the control keys if you find they fall naturally to hand and can be carried out with just the left hand, using the little finger to hold the control key. There is, however, one feature that coincides with the appropriate key in the cursor movement block.

This works fine when you're using a keyboard that has separate keys for control and cursor movements, but on an ordinary typewriter you'll have to stick to the code described above, using the code A as command 1 (ctrl + A). This gives you the option of replacing the text on the screen and it's necessary if you're using the query option, where it stops at each occurrence of the text to be replaced and gives you the option of replacing it or skipping over the next occurrence.

All in all, editing text with WordStar is a somewhat fiddly business. Although carrying out the basic cursor movements with the control characters is easy, the more complicated commands require more complex sequences of control characters, to the point where things do become awkward. If your word processor has dedicated word processing for it speeds up the initial learning period and the actual entry of text.

WordStar uses auto word wrap (which can be switched off if required), as do most word processors nowadays, but it carried this a stage further by right-justifying the line when it wraps a word; this, too, can be turned off if necessary. The effect is that you see on the screen a reasonable representation of what the text will look like when it's printed, an impression aided by the automatic insertion of a dashed line to show where page breaks occur (see Figure 1). Annoyingly, resetting the margins doesn't automatically reformat the text on the screen and it's necessary to issue a reformatting command to do this. The same is true when you insert text; the insertion spills over the margin and the paragraph has to be reformatted by the operator.

A useful feature of WordStar version 3 is the fact that you can use more lines which are longer than the screen width, thanks to a horizontal scrolling feature. This is very handy for producing wide balance sheets, but I found it rather confusing to use for ordinary text.

Unless you turn it off, the insertion mode is always active, so you must insert text simply by moving to the appropriate place and typing it in — the existing text shuts forward to make room for it. Deletion is similarly straightforward, except it operates on character, words, lines, margins and, in this latest version, columns too.

Commands exist for changing the tab stops, centring lines and releasing the margins temporarily, much as one would on an ordinary typewriter.

It's important when processing words to save your text to disk frequently, a lesson I learned the hard way some time ago by getting towards the end of a very long piece of text only to have a power failure which wiped it all out and forced me to start all over again. WordStar has a feature that saves what you've written and continue writing, which is very useful. Additionally, you can save text and either go back to WordStar and work on another document or exit from WordStar if you can simply abandon your file without saving it at all.

More advanced editing commands provide grouping, replacing move, copy, delete and write to a separate file — and there are also find and replace commands. These latter I found rather tedious, particularly the replace command, which insists on showing you what it's doing on the screen, scrolling through the text and replacing as required, which slows the process down considerably. There's only one way to get round this, if you're using the query option, where it stops at each occurrence of the text to be replaced and gives you the option of replacing it or skipping over the next occurrence.

In summary, WordStar is certainly not the easiest word processor to use.
written – jargon and obscure Californi-isms are avoided and there’s none of the silly attempts to be humorous which I personally find extremely irritating in some US-produced manuals (but it could just by my sense of humour which is apparently limited). At all events, I did spot one sneerworthy phrase in the INSTALL manual, though, in the section discussing the fine tuning of your customised WordStar to extend the machine’s capabilities at all the time: ‘Note that “sufficient” may mean acceptable to the general user but tweeking for maximum performance is the American way and writers are often than not possible and effective.’ (Their italics.)

Users
There are, I feel, several reasons why WordStar is so widely sold. I’ve already discussed how it can be installed easily onto just about any CP/M-based machine, either by the dealer or even by the end user – a factor which must obviously have contributed significantly to its dominant position among micro-based WP packages. Additionally, it seems to be marketed aggressively, and MicroPro, its producer, seems to have been willing to do deals with a great many computer suppliers. As a result of this success, the facilities it offers, which are broad and reasonably powerful enough to appeal to most potential WP users.

WordStar’s ability to handle text files larger than the capacity of the computer’s memory is a definite plus for the author/journalist as it saves the drag of splitting documents into several parts. The limitation on document size then becomes the disk capacity and you’re going to have to write quite a large book to exhaust that on most of today’s micros, especially if you have a Winchester hard disk!

As I’ve stated before, the author/journalist does not usually require very elaborate formatting capabilities but he does demand that what he types is easy to use, and this is WordStar’s major-failing, as far as I’m concerned. It isn’t the easiest package to use, either while learning or after considerable practice, although the novice largely doesn’t want to do elaborate things it’s not too bad.

The report writer does want to do elaborate things and the sometimes very clumsy command sequences required by WordStar may appear rather unfriendly to this user. On the other hand, though, he does have a useful range of powerful formatting capabilities at his fingertips – the horizontal scrolling facility which breaks the boundary of the standard 80-column screen. Decimal tabbing, which automatically groups figures around a decimal point at a position specified by the user, is a feature which the financial report-writer will find very useful. Although there’s no facility for performing maths (such as adding up a column of figures) as some financial report-writer might like, it fulfils the WP needs of the majority of people, and fulfils them well.

Conclusions
WordStar is a powerful, popular word processing package, available or easily adaptable to run on just about any CP/M-based microcomputer on the market now. A version to run under CP/M-86 has also been produced, so we’ll see it being offered on the new generation of business machines such as the Sirius, the IBM Personal Computer and others.

Although it fulfils the WP needs of a small or medium-sized business, it can also be a rather awkward package to use – particularly with some of the sequences of control codes needed to execute the more advanced editing commands. Although it can be configured to fit a wide range of machines, there is no provision for tailoring the package to do more complex things, such as exists in Spellbinder or Amethyst (but I must qualify this by stating that, from talking to users of these packages, I find they appeal more to programmers and computer professionals than to laypersons – the latter can find them quite intimidating).

The main competitor to WordStar – in terms of power and facilities plus ease offriendliness of operation – must be Magic Wand, perhaps the most user-friendly, easy to use and is more powerful, incorporating features which, with WordStar, you have to pay extra for in the form of MailMerge, two add-on packages from the same stable. Until now, though, Magic Wand has not been marketed with the same aggression as WordStar and has not been made available for as many machines, lacking as it does the versatility provided by WordStar’s INSTALL module. On paper, were I to have to choose between the two, I would buy Magic Wand; in practice, though, the chances are that I’d have to buy WordStar simply for the ease of installation. WordStar costs £295 from Transam or £215 with MailMerge.

Hardware
Although these WP Benchtests are primarily a review of software packages, it is interesting to comment on the hardware used for the review, where this has not previously been reviewed in PCW or where it has features directly relevant to word processing.

In this case, Transam Computers kindly lent us a Tuscan on which to review WordStar. We reviewed the Tuscan back in its early days in January 1981 and a lot has happened to it since then. Most notably, Transam has developed a memory-mapped 80 x 24 video display board which has added the Tuscan’s S100 bus and makes the machine more suitable for word processing and other ‘serious’ applications. The standard high resolution WP packages are supplied with 5¼in floppy disks, either single or double sided for a maximum capacity of 760k, expandable by adding a further two drives if necessary. Or you can use 8in drive options for 8 Mbytes or a mixture of 5½in and 8in drives. Hard disks are also available to give up to 100 Mbytes of disk storage, which should have been enough for even the most prolific of writers.

A range of add-in S100 boards is also available, including a Prestel-format colour video board and a high resolution graphics board as well as a speech synthesiser board.

I had mixed feelings about its suitability for word processing. Certainly, the Tuscan is fine for the general business user to whom word processing is just one of several applications which must be carried out on the same machine. But for somebody who’s interested mainly or exclusively in word processing, the Tuscan is not the ideal machine, mainly because of its keyboard. Firstly, the keys have a rather ‘dead’ feel to them and tend to sound rather tinny. Secondly, this is a personal matter and everybody may be as fussy as I am about keyboards – but there isn’t the solid business-like feel to the Tuscan’s keyboard which you find on many other business micros. More serious, though, is the small number of keys provided – just the standard typewriter keyboard plus a few programmable keys. A typewriter has a minimum of computer keys – ESCAPE, DELETE and CONTROL. There are no editing or programmable function keys, making it a somewhat datedlooking machine, and worse, as far as word processing goes, there’s no repeat function, either by holding down a key or by pressing a separate repeat key.

However, the display generated by Transam’s VB4 video card was excellent, giving a clear picture which was rocksteady at all times and with a good, easily readable character set with proper descenders. The keys are programmable and two versions of WordStar were provided for this test – one using inverse video to pick out the help menus and the other using an attractive italics face for the same purpose (see Figure 1 again). The versions were supplied as auto-start disks – switching on the reset button on the machine caused it to boot CP/M (unusually quick on the Tuscan as it’s partially in ROM), load either the inverse or italics character set and then load and run WordStar, all with the operating system. This means that from telling the machine what size of disk the system has in response to the prompt which appears when the machine is switched on, it is possible to boot on a phone line or a tube ride instead of being inaccessible in California and from personal experience I can say that this is both time-saving and of importance when your business depends on a quick and useful response to a problem.
Many people think that because a personal computer does difficult things it must be difficult to operate. Not so. At least not so with the Format-80 professional word processing system. The Format-80 system lets you and your staff concentrate on doing your work, not on working your computer.

* **EASE OF USE** is the cornerstone of Format-80. Anyone who can use a typewriter keyboard soon feels at home using Format-80 on the Apple II. Example - upper case characters are generated using the shift key - a lot of word processing systems use the ESCape key. Editing commands are introduced using a one keystroke mnemonic command.

* **FEATURES** of entering and editing text make Format-80 the favourite word processing system with office staff. Automatic carriage return insertion (word wrap around) means that they do not have to be concerned with line length; text is automatically adjusted to fit within defined page dimensions.

* **PROFESSIONAL PRESENTATION** of text is enabled using the powerful formatting capabilities of Format-80. Text centreing and justification, coupled with paragraph indentation allow production of high quality work with little effort. Text manipulation commands allow tabulation of columns of figures and easy insertion, location/correction and deletion of text. Whenever text is amended the changes are displayed immediately on the screen - including underlining.

* **PRINTING** of text may be performed on all popular printers. (Telex tapes can be produced directly from an Apple using Format-80). Proportional spacing, emboldening, shadow printing and sub and superscripts are all available on printers which support these functions.

* **COMPREHENSIVE MAIL LIST** facilities allow storage and retrieval of names and addresses which may be printed on adhesive labels or incorporated into documents using standard or specialised paragraphs. Powerful 'logic' commands make it possible to select only those records which match specified criteria.

* **TECHNICAL DETAILS** for the non-technical: Format-80 runs on the Apple II with 48K of memory Apple disk drive and a monitor. An Omnivision or Videx card is also required to provide the 80 character per line display.

* Format-80 is available from most Apple dealers or direct from Personal Computers Limited and costs £300 (ex VAT) - this includes the mail merge facilities as well as a mailing list sorter.

For further details please contact your local dealer or complete the coupon below and send to: Dept WPD, Personal Computers Limited, 194-200 Bishopsgate, LONDON EC2M 4NR.

Please send me details of Format-80 and the address of my nearest supplier:

Name .................................................................
Company ................................................................
Address ..................................................................
Phone: .................................................................

I do/do not own an Apple Personal Computer.