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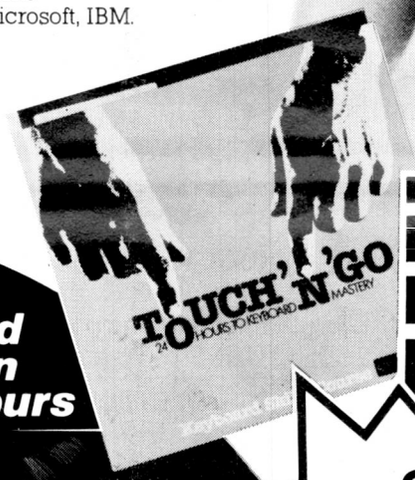

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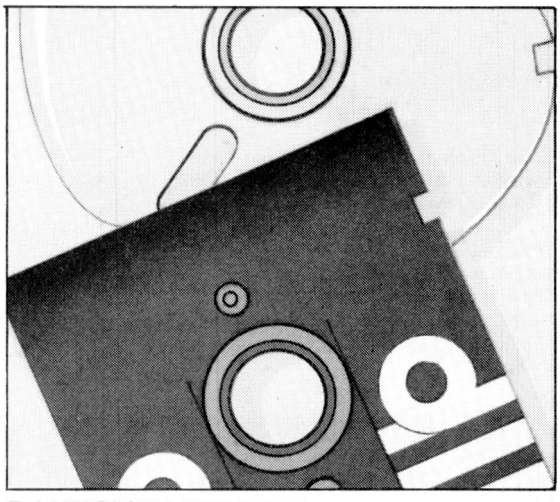

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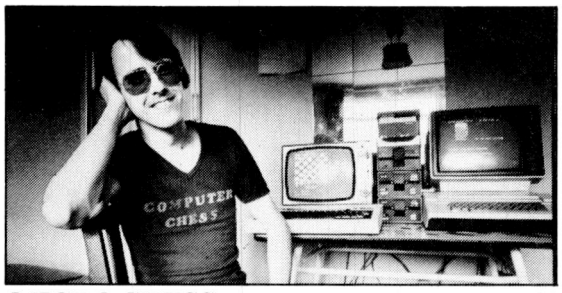

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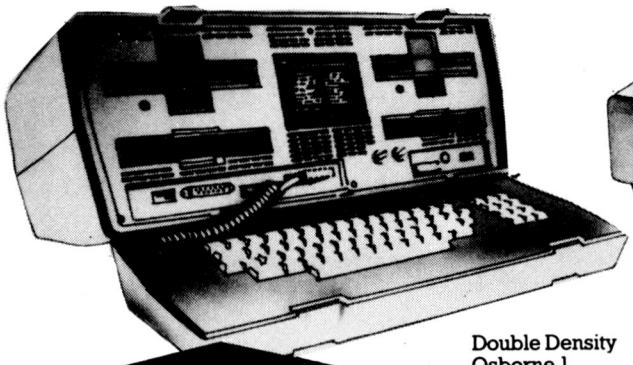

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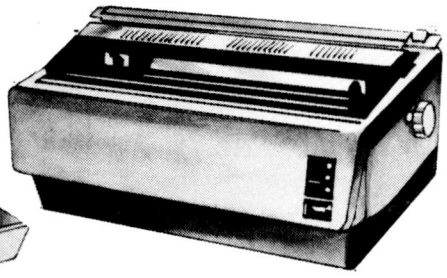

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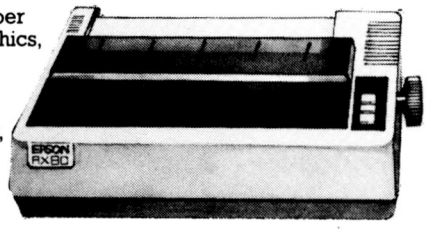

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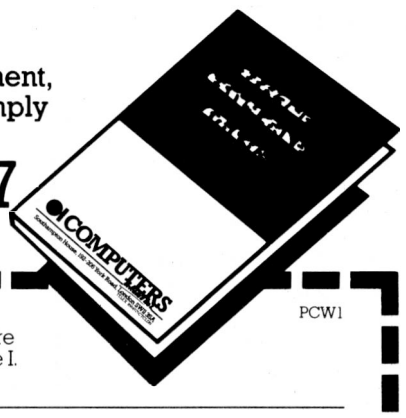

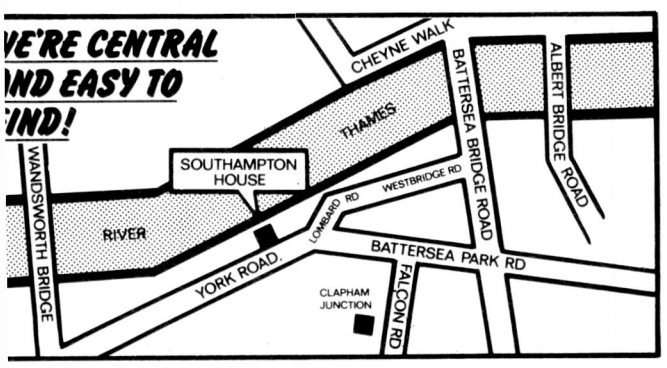

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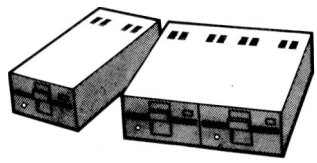

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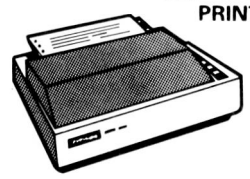

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1 843M	200	20 0MHz	200
2 0MHz	225	24 0MHz	170
3 2768M	150	24 930M	325
3 57594	98	48 0M	175
3 6864M	300	100 0M	375
4 0MHz	150		
4 433619	100	100KHz	236
5 0MHz	160	1.28MHz	392
6 0MHz	140	2.4576M	200
6 144MHz	150	3.276MHz	160
6 5536M	200	4.032MHz	290
7 0MHz	150	4.194304	200
7 168MHz	160	4.80MHz	200
7 68MHz	200	5.185MHz	300
8 0MHz	150	5.24288	390
9 0MHz	200	7.7328M	250
9 375M	350	8.0833M	395
10 0MHz	175	8.86723	175
10 7MHz	150		
10 24MHz	200		
12 0MHz	175		
12 528M	300		
14 31818	170		

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Speed Block type	PCB Plug with latch Strt Pins	PCB Plug with latch Angle Pins	Female Header Socket	Female Card-Edge Connectors
Two rows				
10 way	90p	99p	85p	120p
16 way	130p	150p	110p	—
20 way	145p	166p	125p	195p
26 way	175p	200p	150p	240p
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24"	210p	235p	345p	540p
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14pin	10p	35p
16pin	10p	42p
18pin	16p	52p
20pin	22p	60p
22pin	25p	70p
24pin	25p	70p
28pin	28p	80p
40pin	30p	99p

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16	25p	40p
20	30p	50p
26	40p	65p
34	60p	85p
40	70p	90p
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2×32 way 41612 A+C	275p	320p	220p	285p
2×32 way 41612 A B C	295p	340p	240p	300p
3×32 way	360p	385p	260p	395p

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2×23way	185p	
2×25way	225p	220p
2×28way	210p	
2×30way	245p	
2×36way	295p	
2×40way	315p	
2×43way	395p	

D CONNECTORS: Miniature

Male	9 way	15 way	25 way	37 way
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Angle	160p	210p	250p	355p
Pins	120p	130p	195p	295p

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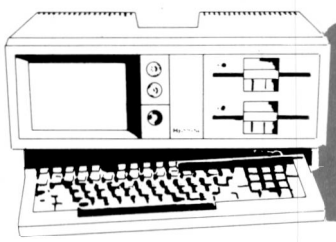

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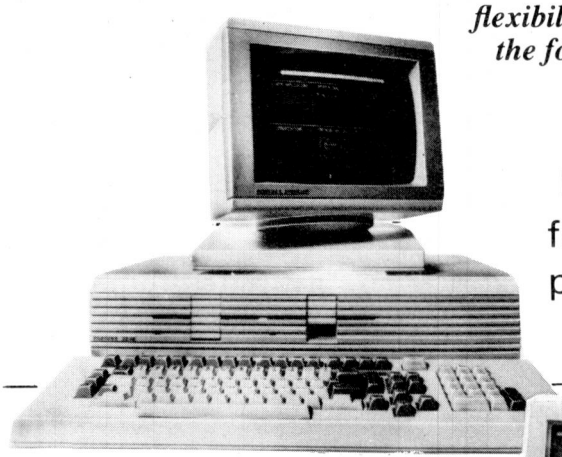

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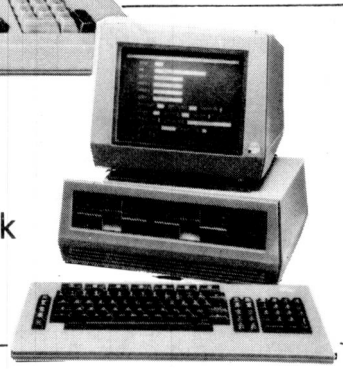

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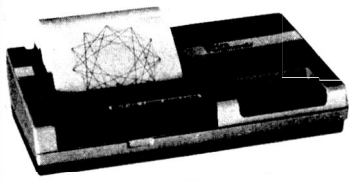

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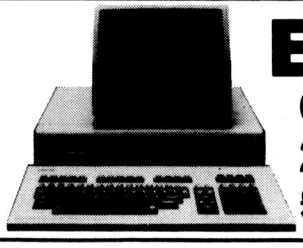

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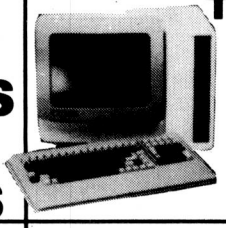

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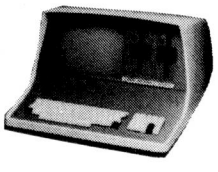

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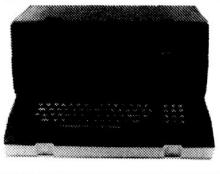

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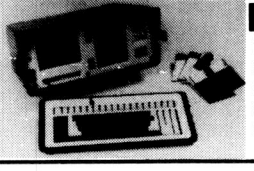

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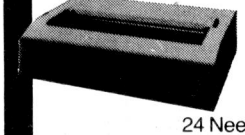

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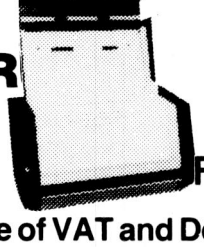

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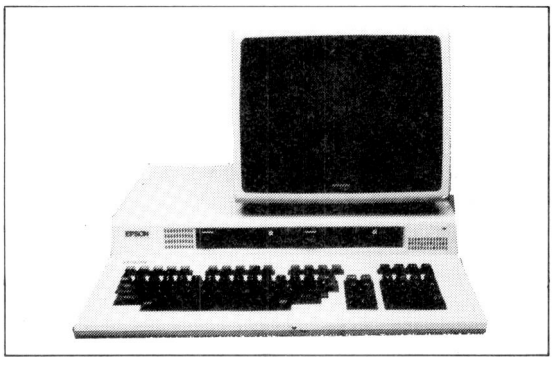

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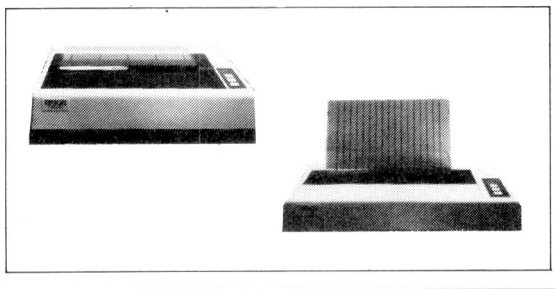
RX80 & FX80 PRINTERS



Two exciting new printers that have the usual Epson qualities like reliability modern styling and speed — and successfully surpass the performance of earlier machines.

The RX80 Features:

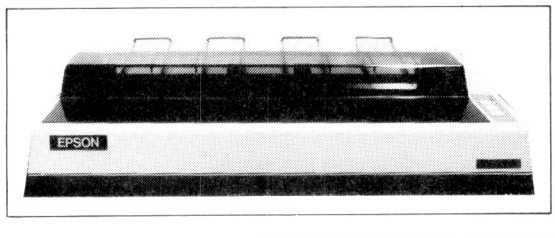
- ★ 100 character per second
- ★ Dot addressable graphics.
- ★ Condensed and double width printing.
- ★ Tractor feed for exact alignment.

The FX80 Features:

- ★ 160 characters per second.
- ★ Proportional spacing, quick form tear off, superscripts, and down loadable character set.

Both printers have standard Centronics parallel interface with IEEE 488, RS232C etc optional interfaces.

MX 100 III



Another stylish and versatile printer from the Epson family.

Features

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- ★ Full 96 ASCII with decenders, 8 international character sets.
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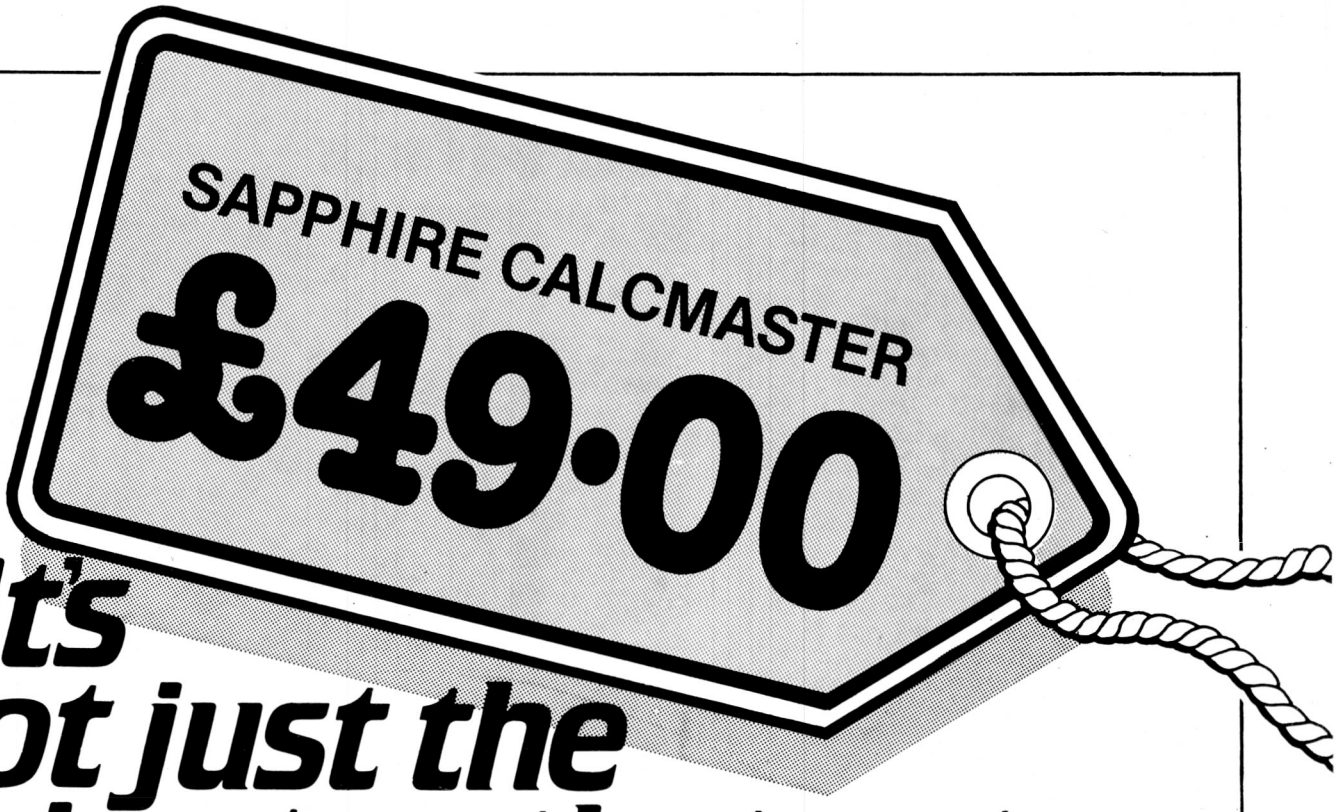

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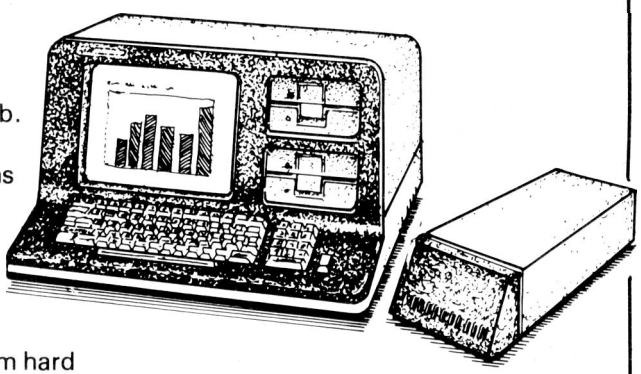
Another Advantage +

INTERAM HARD DISK

The new Interam hard disk subsystem, for use in conjunction with the NorthStar Advantage and Horizon microcomputers, is now available. Fully tested and proven, this powerful unit incorporates the excellent range of RODIME mini Winchester hard disk drives, and is available in either single or dual drive versions. Both fixed and/or removable cartridge disks can be used. Fixed drive units provide a formatted capacity of 5,10,15,&20Mb.

The unit will interface to most 8 and 16 bit microcomputers, and MS-DOS backed systems are also available. The Interam hard disk drive is housed in a handsome cabinet, complementing the NorthStar Advantage microcomputer, includes the Western Digital controller, and comes complete with CP/M driver and installation software.

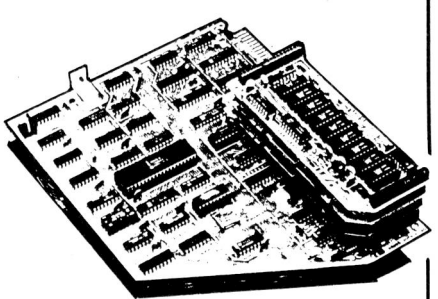
Using a simple plug-in adaptor card, the Interam hard disk drive easily interfaces with the NorthStar Advantage, further expanding your computing capabilities to meet growing system requirements.

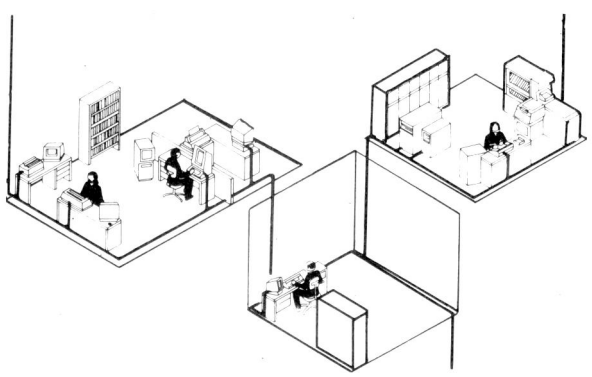


NORTHSTAR ADVANTAGE

An attractive and powerful integrated graphics computer, the NorthStar Advantage is eminently suited to educational and business uses alike. The Advantage effectively displays data pictorially on its high-resolution screen, and in conjunction with a printer produces hard copies to concisely illustrate statistical data. An 8/16 Advantage upgrade board is now also available, offering 8-bit Advantage users a low-cost path to the benefits of 16-bit computers.

This powerful, compact and self-sufficient computer may be further enhanced by a broad selection of peripherals and CP/M or MS/DOS compatible software.





NORTHNET

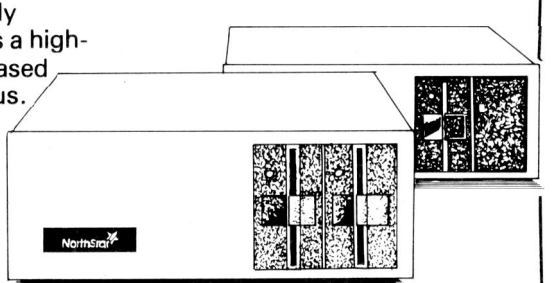
The powerful NorthNet facility allows up to 64 NorthStar Advantages to be linked together, with the simple addition of one inexpensive NorthNet local area network linking board. NorthNet is easily installed, and provides the benefits of multi-user operation, such as shared high-quality printers, multi-user file-sharing, and shared communication gateways. Each Advantage then becomes a NorthNet work station with facilities for an optional private printer. The NorthNet local area network enables full linkage between 8 and 16 bit Advantages.

HORIZON

The NorthStar Horizon is a popular and highly reliable microcomputer, firmly established in the microcomputer field since its introduction in 1978. There are now over 100,000 Horizons in operation throughout the world in business offices, schools and universities, research laboratories, and industrial plants.

The Horizon's versatility enables it to adapt to an almost unlimited number of uses, ranging from word processing to highly complex industrial monitoring. The standard Horizon is a high-performance dual 5.25 floppy disk drive 4MHz Z80A based microcomputer with 64K of RAM and 12 slot S-100 bus.

Powerful and flexible, the Horizon can be expanded with the addition of multi-processing cards, Interam Hard Disk, and Turbo-Dos software to support several users.



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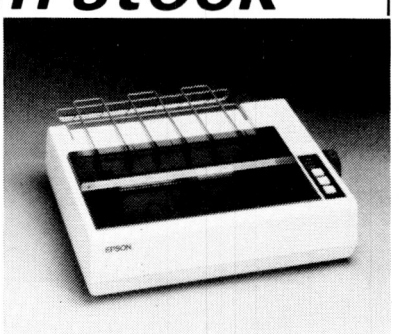

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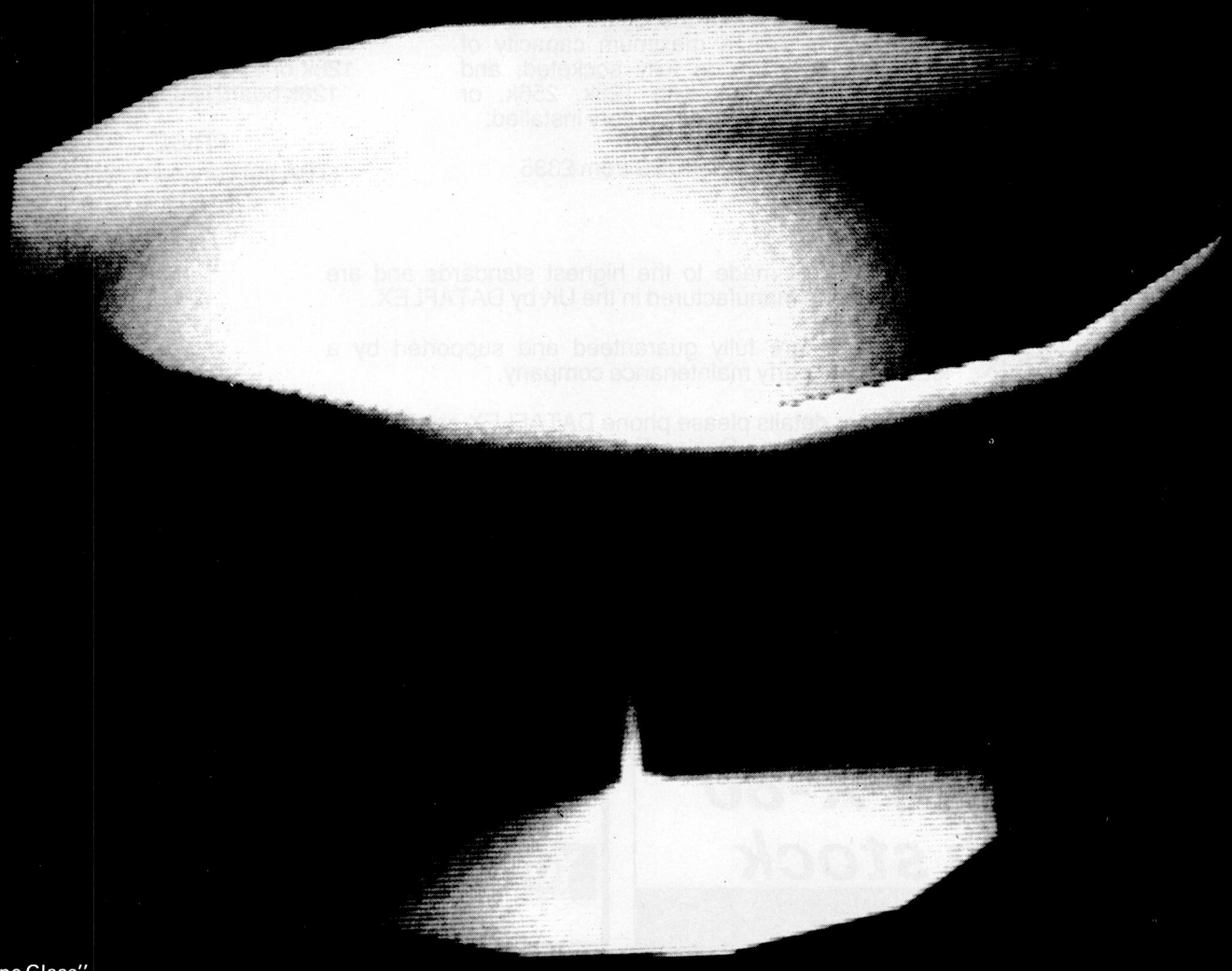

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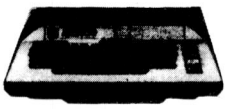

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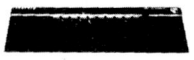

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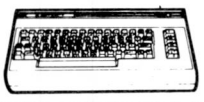

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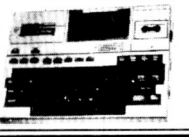

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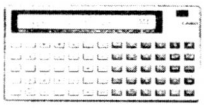

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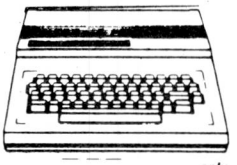

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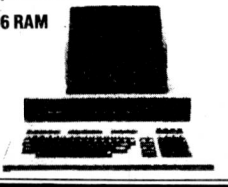

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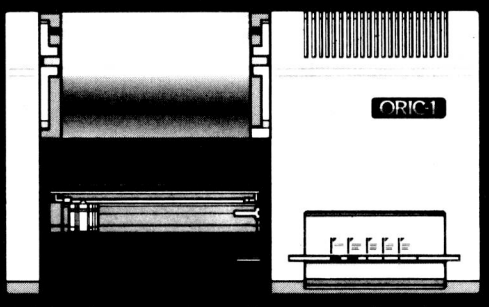

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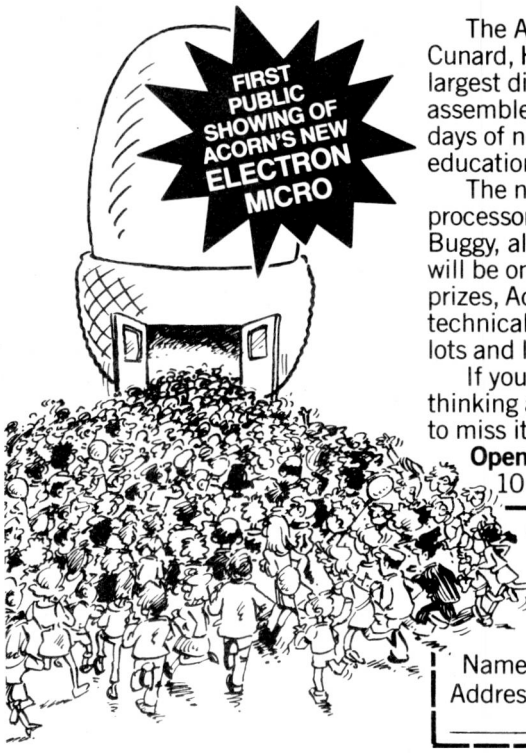

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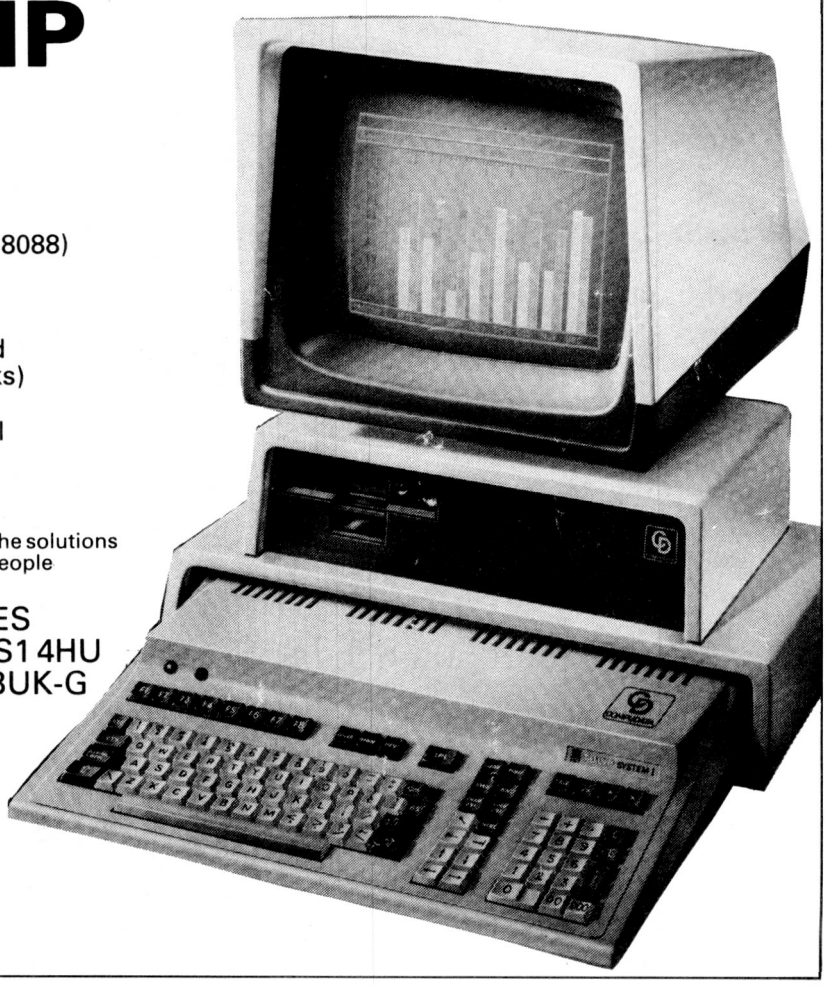

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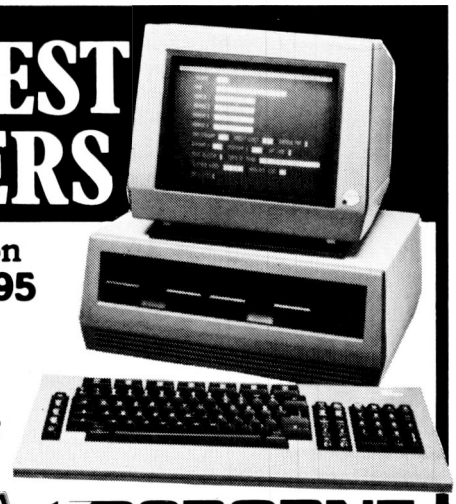

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NEW £59.95

J. B. SNOOKER T/A POT BLACK

* TRIAL BALANCE AT 31/12/82 *

	ACCOUNT	DEBIT £	CREDIT £
1	Sales (1)		40000
2	Sales (2)		45001
7	Opening Stock & WIP	3000	
8	Purchases (1)	31600	
9	Purchases (2)	17150	
12	Closing Stock & WIP		5000
13	Sundry Income		700
14	Wages	8430	
15	Wife's Wages	1200	
16	Rent & Rates	1925	
17	Heat Light & Power	625	
18	Telephone	1620	
20	Insurance	211	
21	Motor Expenses	2560	
24	Repairs & Renewals	740	
27	Sundry Expenses	911	
28	Accountancy	600	
29	Legal & Professional	150	
31	Finance Charges	5510	
32	Bad Debts Written Off	1269	
33	Motor Vehicles - Dep'n	200	
35	Plant/Equipment - Dep'n	150	
36	Leasehold Property - Dep'n	100	
37	Loss/(Profit) on Sale of Assets	150	
47	Cash in Hand	500	
48	Bank (1)		34400
49	Band (2)	500	
50	Freehold Property	20000	
52	Leasehold Property	30000	
53	Leasehold Property - Acc Dep'n		5000
56	Motor Vehicles	4000	
57	Motor Vehicles - Acc Dep'n		500
58	Pland & Equipment	2500	
59	Plant & Equipment - Acc Dep'n		500
60	Goodwill	2000	
61	Debtors & Prepayments	2000	
63	Trade Creditors & Accruals		9300
65	H.P. (1)		900
69	H.P. Interest Res (1)	100	
74	VAT Input Tax	5163	
75	VAT Output Tax		9063
76	VAT Refunds/Payments	4400	
77	Capital A/c (1)		15000
78	Capital A/c (2)		5000
81	Capital Introduced (1)		500
85	Drawings (1)	8600	
86	Drawings (2)	12000	
89	Long Term Loans		4000
90	Stock & WIP	5000	
	TOTALS	174864	174864

N. B. Sundry Expenses debited by £1, due to rounding errors

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

The software is extremely well and lucidly documented, and Gemini provide a full technical back-up and product up-date policy. Take a look at the information this program will provide:-
* Summary of VAT information for VAT returns * Cumulative receipts and payments report analysed over the standard profit and loss and balance sheet headings * Option for departmental analysis of sales and purchases * Audit trail printout of all transactions. * Journal routine for entering transfers between accounts and year end adjustment for debtors, creditors etc. * Trial balance at any interval * Interfaces to 'Final Accounts' program to produce balance sheet and trading and profit/loss account etc. * Spectrum version may be used with Sinclair OR 80 column printer.

FINAL ACCOUNTS PROGRAM FOR BBC 32K, TORCH, SPECTRUM 48K. £59.95
NEW

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

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

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

J. B. SNOOKER T/A POT BLACK

* BALANCE SHEET AT 31/12/82 *

	1982 £	1981 £
Fixed Assets	50500	30950
Goodwill	2000	2000
	52500	32950
CURRENT ASSETS		
Stock & WIP	5000	3000
Debtors & Prepayments	2000	4000
Cash in Hand	500	200
VAT recoverable	500	
	8000	7200
LESS CURRENT LIABILITIES		
Trade Creditors & Accruals	9300	3300
H.P.	800	1000
Bank Overdraft	33900	8250
VAT payable		600
	44000	13150
NET CURRENT ASSETS/(LIABILITIES)	(36000)	(5950)
NET ASSETS (LIABILITIES)	£ 16500	£ 27000
REPRESENTED BY		
Capital A/c (1)	13200	16000
Capital A/c (2)	(700)	6000
Long Term Loans	4000	5000
	£ 16500	£ 27000

J. B. SNOOKER T/A POT BLACK

* TRADING AND PROFIT/LOSS ACCOUNT *

PERIOD : 1 YEAR ENDED 31/12/82

	1982 £		1981 £	
Sales (1)	40000		27501	
Sales (2)	45001		24501	
TOTAL SALES	85001		52002	
Opening Stock & WIP	3000		2000	
Purchases (1)	31600		18195	
Purchases (2)	17150		12750	
	51750		32945	
Closing Stock & WIP	(5000)		(3000)	
COST OF SALES	46750		29945	
GROSS PROFIT (%)	38251	(45%)	22057	(42%)
Sundry Income	700		500	
	38951		22557	
LESS EXPENSES				
Wages	8430		7540	
Wife's wages	1200		1200	
Rent & Rates	1925		1725	
Heat Light & Power	625		586	
Telephone	1620		1470	
Insurance	211		135	
Motor Expenses	2560		1470	
Repairs & Renewals	740		453	
Sundry Expenses	911		828	
Accountancy	600		500	
Legal & Professional	150		250	
Finance Charges	5510		2670	
Bad Debts Written Off	1269		1000	
TOTAL EXPENSES	25751		19807	
DEPRECIATION				
Motor Vehicles	200		200	
Plant/Equipment	150		150	
Leasehold Property	100		100	
Loss/(Profit) on Sale of Assets	150		200	
TOTAL DEPRECIATION	600		650	
TOTAL OVERHEADS	26351		20557	
NET PROFIT/(LOSS)	£ 12600		(2000)	

NOTES TO THE ACCOUNTS - 31/12/82

1. FIXED ASSETS

	Land & Buildings £	Motor Vehicles £	Plant & Equipment £	TOTAL £
Cost or Valuation	50000	4000	2500	56500
Acc. Depreciation	5000	500	500	6000
NBV - 1982	£45000	£3500	£2000	£50500
NBV - 1981	£25100	£3700	£2150	£30950

2. LAND AND BUILDINGS

	1982 £	1981 £
Land and buildings comprise		
Freehold Property	20000	
Leasehold Property	25000	25100
	£45000	£25100

3. CAPITAL ACCOUNTS

		(1) £	(2) £
	Opening Capital	15000	5000
Add	Capital Introduced	500	0
	Profit/(Loss) for Year	6300	6300
		21800	11300
Less	Drawings	(8600)	(12000)
		£ 13200	£(700)

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(WHICH MICRO AND SOFTWARE REVIEW)

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HOME ACCOUNTS. . .£19.95
Compatible with most micros. See table. Runs a complete home finance package for you with every facility necessary for keeping a track of regular and other expenses, bank account, mortgage, H.P., etc. This program also allows you to plot graphically by Histograms your monthly outgoings.

WORD PROCESSOR. . .£19.95
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"Ideally suited to the way most offices run....."
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NEW

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

```
   POSITION   A1    RC        SPACE   5185        T
        II          A          II      B    II     C    II
 1    -J.B. SNOOKER T/A POT-BLACK
 2     PROJECTED CASH FLOW              YEAR        ENDED
 3
 4                                      Oct.        Nov.
 5                                       £           £
 6     INCOME
 7     Sales                           11786       10944
 8                                     ------      ------
 9
10     REVENUE EXPENDITURE
11     Purchases                         500         500
12     Advertising                       500        1000
13     Director's salary                1596        1596
14     Salaries                         2216        2216
15     Rent
16     Telephone                                     300
17     Insurance                                     200
18     Printing, stationary                          400
19     Repairs & renewals
20     Hire of equipment                  60          60
COMMAND BCDEFGPRSTW*?
```

Without any programming knowledge at all, you may:-

* Set up a computerised spreadsheet, with chosen row and column names.
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* Enter your source data and have the results calculated.
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* Print the tabulated results in an elegant report format.
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Some typical applications:—

* Small business accounting applications, e.g. profit and loss statements and cashflow projections, break-even analyses etc.
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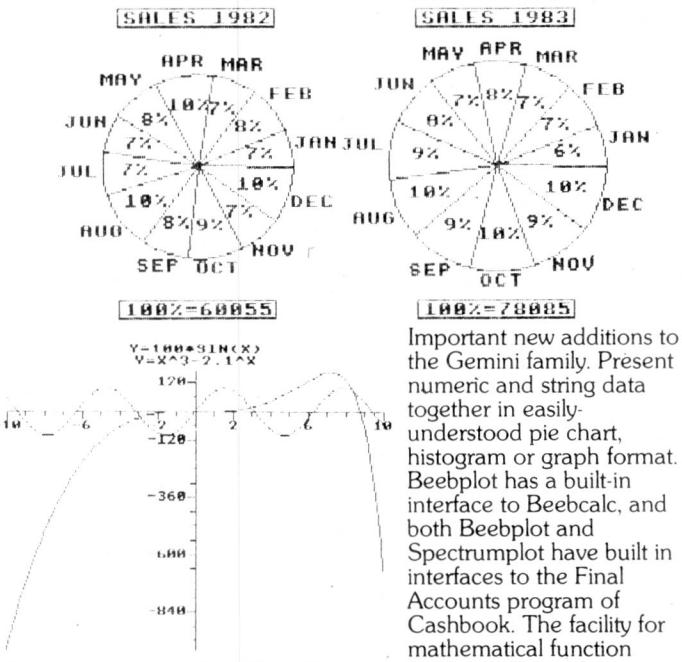
* Comparing rent/lease/buy options.
* Processing the results of scientific experiments or field studies.
* Engineering calculation models.
* In fact, anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

Program Availability Chart:-

	Database	Stock Control	Mailist	Invoices & Statements	Spread sheet Analysis	Cashbook Accounting	Word processor	Home Accounts	Commercial Accounts	Plot	Final Accounts
Sinclair Spectrum 16k or 48k	●	●	●			●		●	●	●	●
Dragon 32k or 64k	●	●	●	●	●			●	●	●	
VIC 20 (16k +)	●	●	●	●				●	●		
Sinclair ZX81 (16k +)	●										
Grundy Newbrain	●		●								
Sharp MZ80A	●	●	●	●				●	●		
Sharp MZ80K	●	●	●	●				●	●		
Sharp MZ80B	●	●	●	●				●	●		
BBC Micro model A or B 32k	●	●	●	●	●	●	●	●	●	●	●
Atari 400/800	●										
Torch	●	●	●	●	●	●	●	●	●	●	●
Epson HX-20	●	●	●								
Commodore 64	●		●					●			

BEEBPLOT & SPECTRUMPLOT £19.95

NEW



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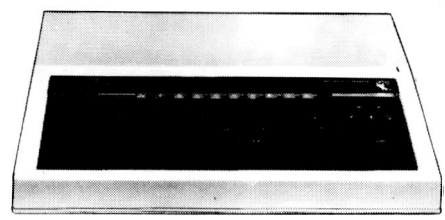

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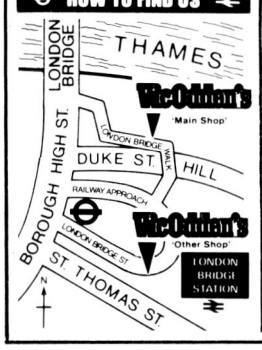

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PRESTEL

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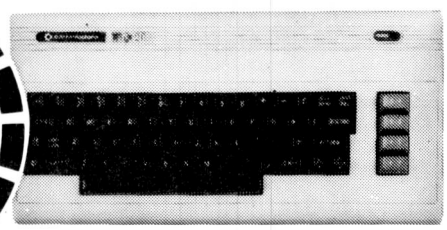

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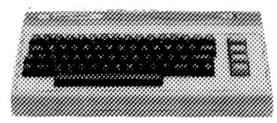

Powerful 64K RAM
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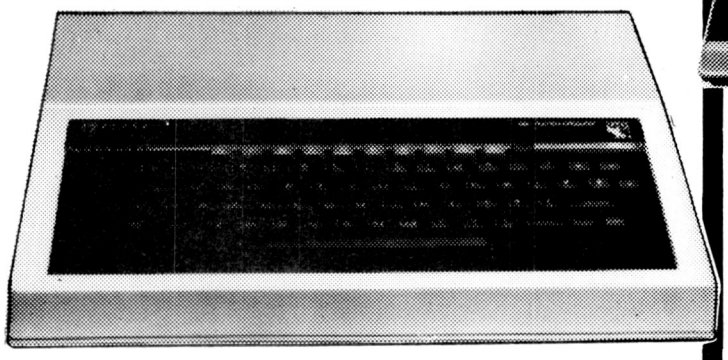
BBC Model 'B' MICRO



Yes, this **top selling Micro system** is now available from your local **SPECTRUM** dealer -the **BBC Model'B'** offering **32K RAM** plus a **full back-up** of **peripherals** & **software** too! It's an **infinitely expandable** machine, ideal for the **home or business** and is already widely used for **educational purposes in schools** - so the chances are **your** children may already be **well familiar with its operation,** which must make it the **ideal choice** for the **home** too!

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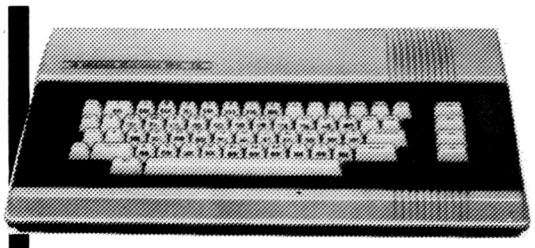

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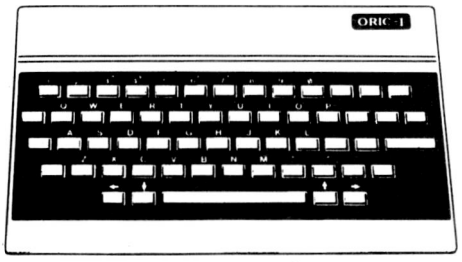

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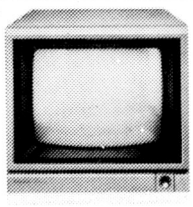

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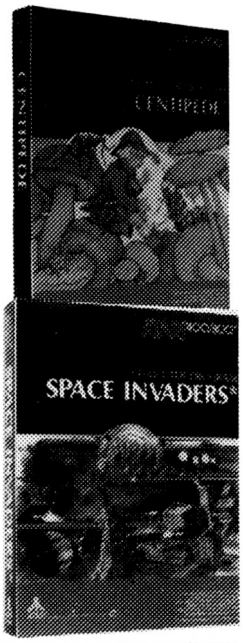

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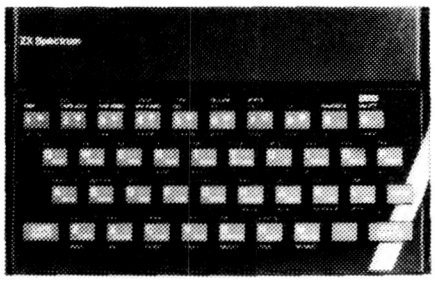

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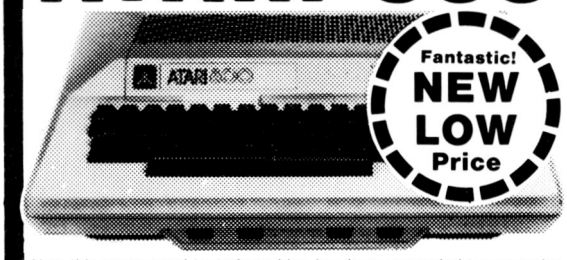

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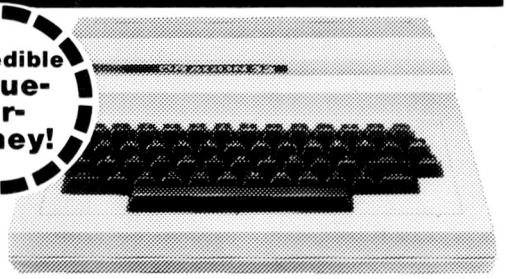

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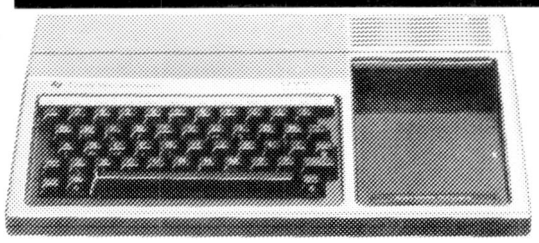

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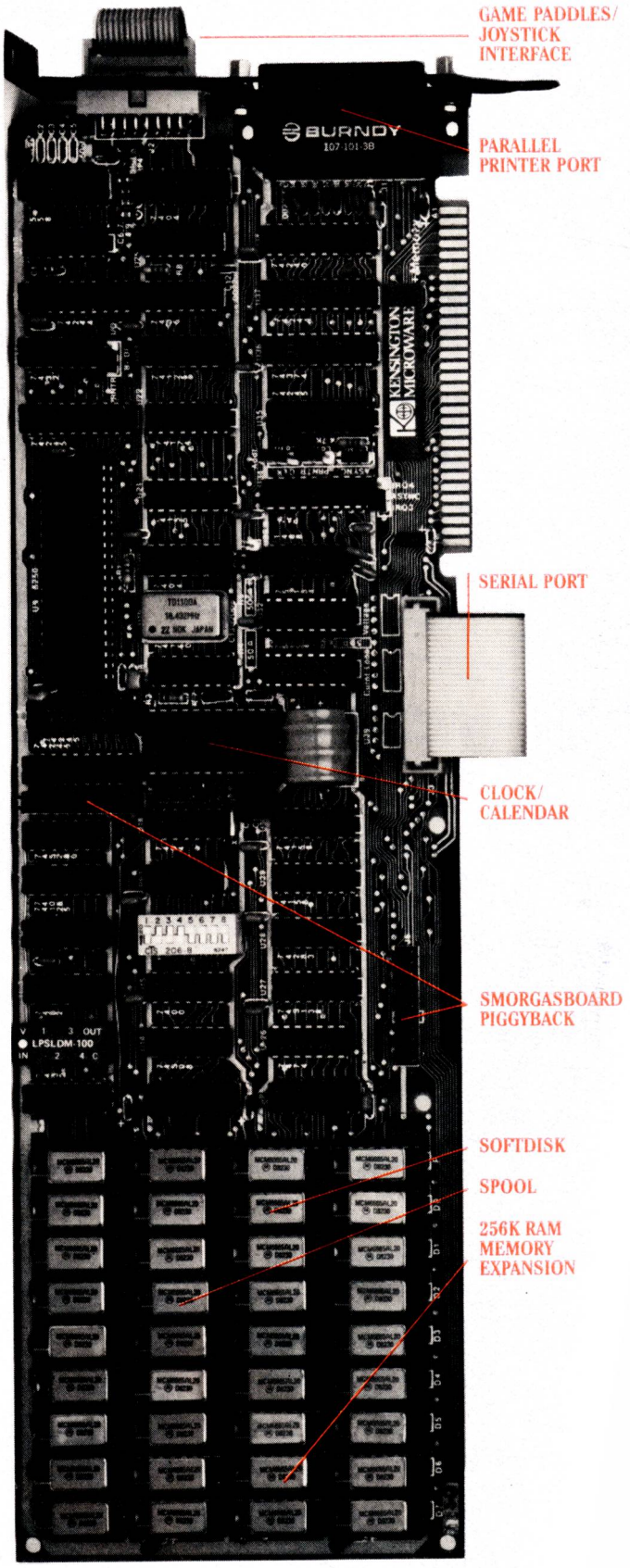

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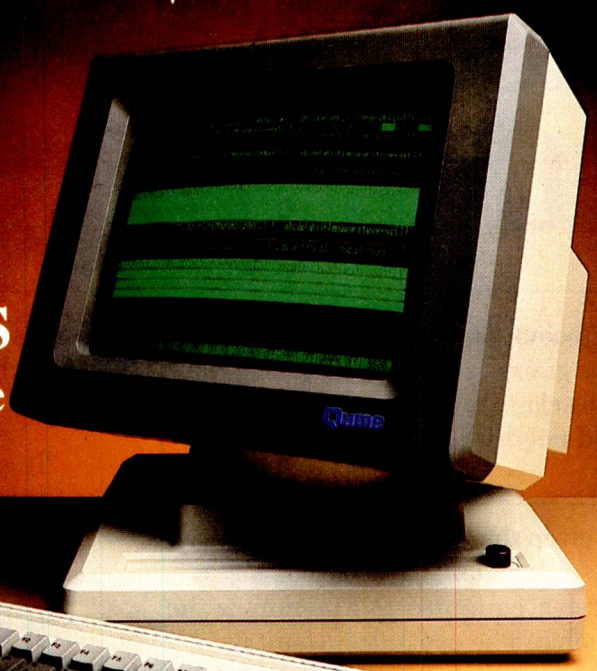

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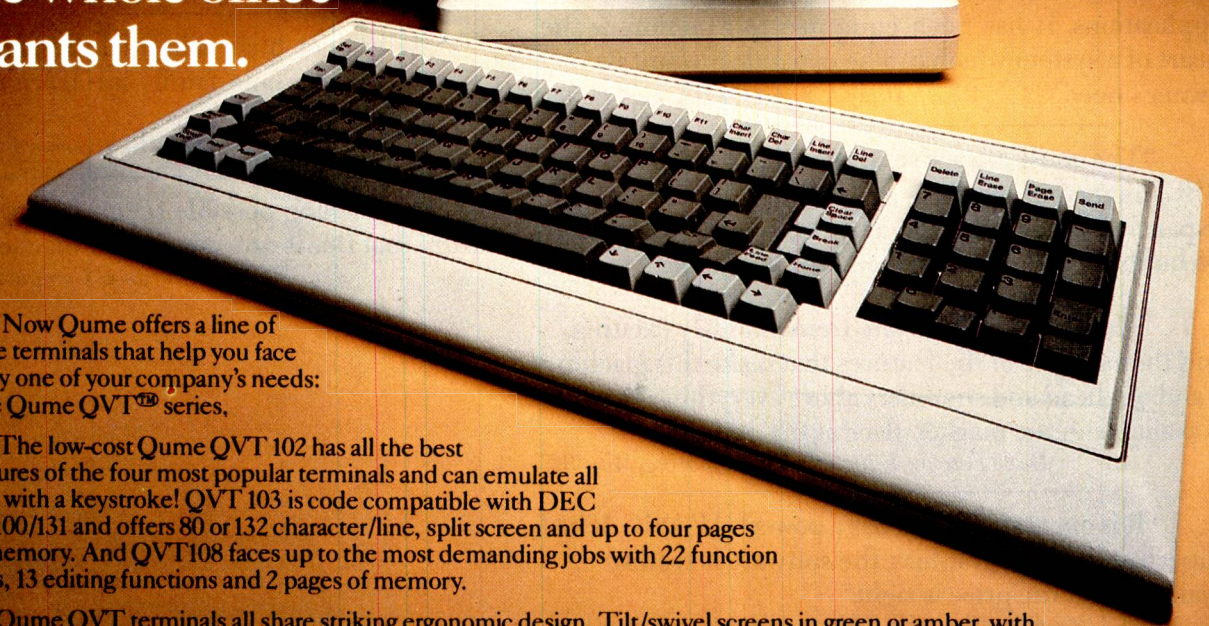

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Why the BBC Micro? It might be fairer to let someone else answer that question.

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"The basics are easy to follow. My wife has developed a program for teaching our daughter French vocabulary. Our daughter uses it mainly for games and simple programming."
Dr. A. Yarwood, a BBC Micro owner from Co. Durham.

"It is a very powerful computer. My husband has written his own data base. I have been writing programs and programming games. Even the children have written small programs."
Mrs. A. M. Thomas, a BBC Micro owner from Devon.

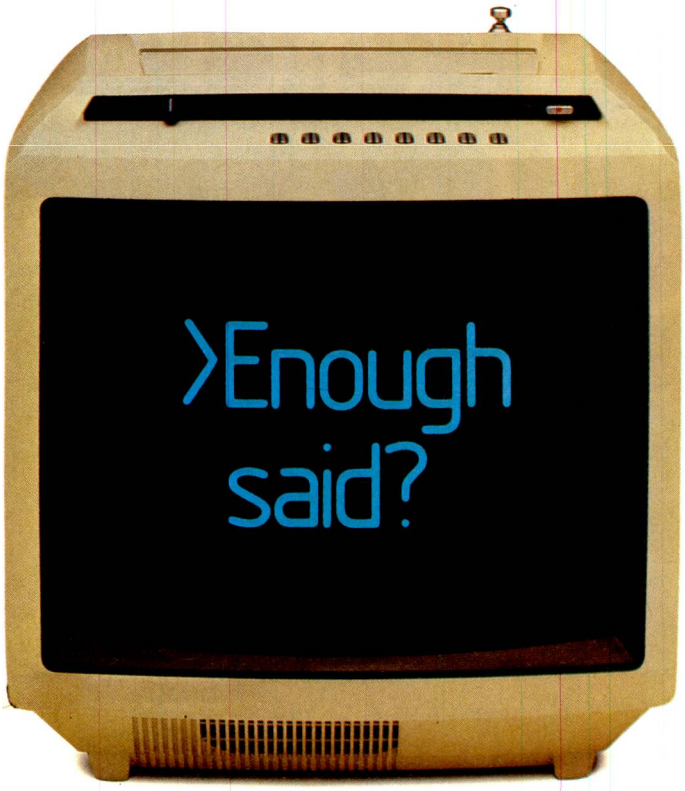
"No other computer can offer such ease of use when dealing with complex sound effects."
Which Micro, June '82.

"It isn't often a journalist can sit down to write about a computer with the certain knowledge that he has never seen a nicer machine."
Guy Kewney, Personal Computer World, Dec. '82.

"It has got huge potential. Besides playing the games, the whole family are learning basic programming."
Mr. P. S. Green, a BBC Micro owner from Staffordshire.

"Everything possible seems to have been done to ensure that this is not a 'dead end' machine..."
Paul Beverley, Personal Computer World, July '82.



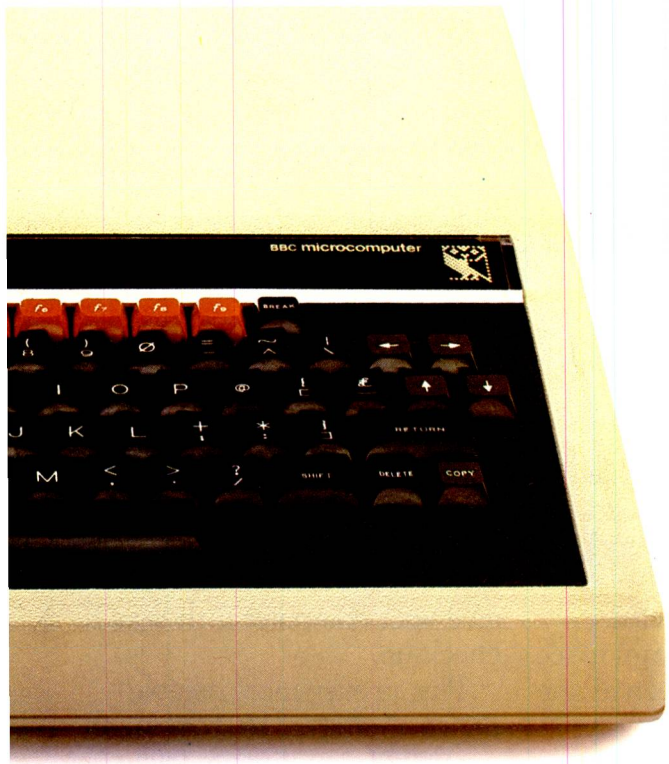


Perhaps we could just add that the BBC Micro is the machine which was chosen to be at the heart of the BBC's massive Computer Literacy Project.

It is also the machine which, having won the Department of Industry's blessing, will account for over 80% of the computers bought by British schools this year.

And now for some facts about the machine itself.

The BBC Micro is light, compact and, with a conventional electric typewriter keyboard, easy to get the feel of.



It can be loaded from virtually any cassette recorder. And there is a wealth of ready-made programs available covering games, education and business subjects.

The BBC Micro uses BBC BASIC, a sophisticated version of the most popular computer language.

However, as your confidence and fluency grow, it can be adapted to switch to other languages.

It can also become a word processor, with the facility to link with a second processor for high-powered business use.

A disc drive unit can also be added. And with an adaptor, the BBC Micro is the first micro to be able to pick up programs from the Micronet–Prestel system. Another adaptor converts your TV into a Teletext receiver, with further ability to download programs.

All this for only £399.

The most sophisticated version of the BBC Micro, the Model B, is only £399. The basic Model A is £299. (Both come with a "Welcome cassette" and comprehensive introductory manual.)

They are both available from John Lewis, selected branches of Boots or local stockists.

Alternatively, if you would like to order a BBC Micro B with your credit card, or if you want the address of your nearest stockist, just phone 01-200 0200.

Or, you can buy a Model B by sending off the order form below to: BBC Microcomputers, c/o Vector Marketing, Denington Estate, Wellingborough, Northants.

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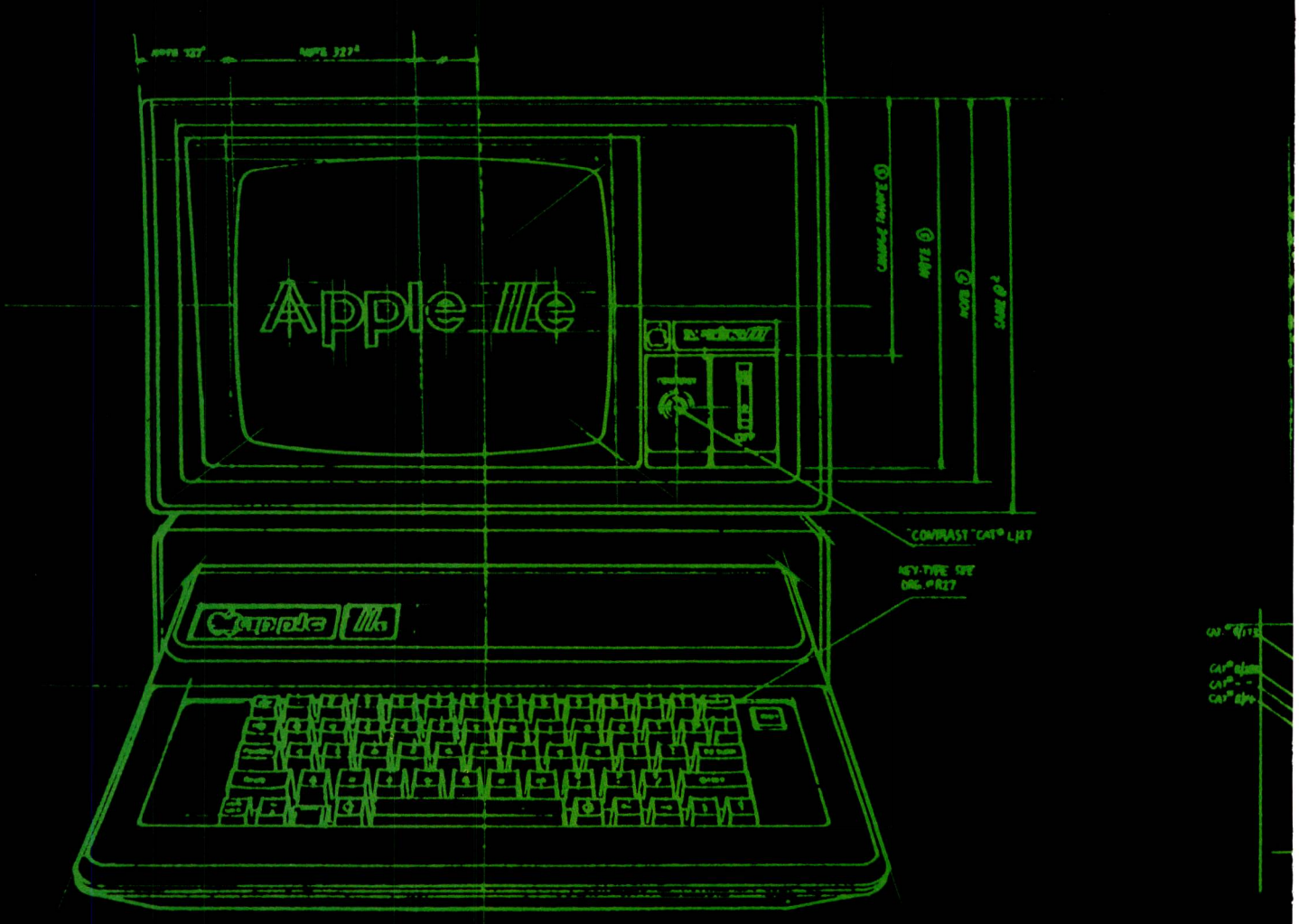
The BBC Microcomputer System.

Designed, produced and distributed by Acorn Computers Limited.

See the BBC Microcomputer System at The Acorn User Exhibition at The Cunard Hotel, London, W6. August 25-28.

It's the same old Apple II.



For years, people have been trying to build a better Apple® II.

It finally happened.

Meet the Apple IIe, an impressive new version of a most impressive machine.

The "e" means enhanced.

Which means a bundle of new features:

A standard memory of 64K (versus 48K) that's easily expandable. So you can create fatter files and crunch larger numbers of numbers.

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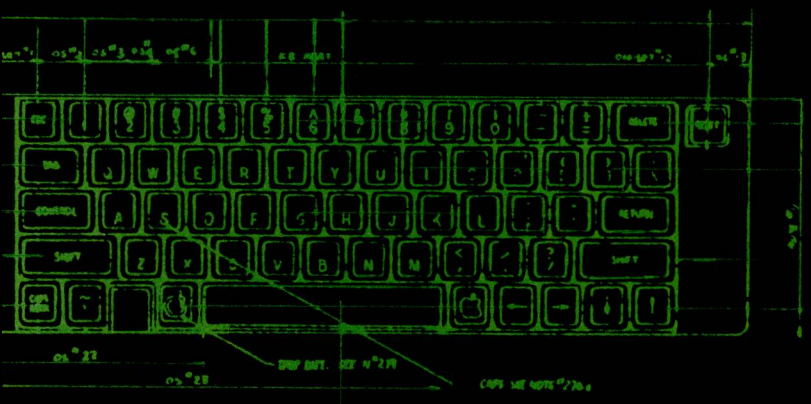
Improved peripheral ports. Which make it a lot easier to connect and disconnect game controllers, printers and all those other wonderful things that go with an Apple Personal Computer.

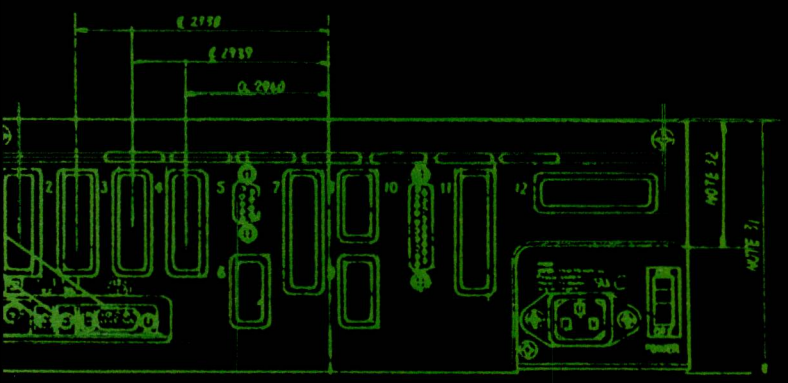
Self-diagnostics. That's a special feature that makes it easy to give your computer a thorough check-up.

Plus an even more reliable design. Achieved by reducing the number of components – which is to say, the number of things that could go wrong.

Except for the front, back and inside.



KEYBOARD



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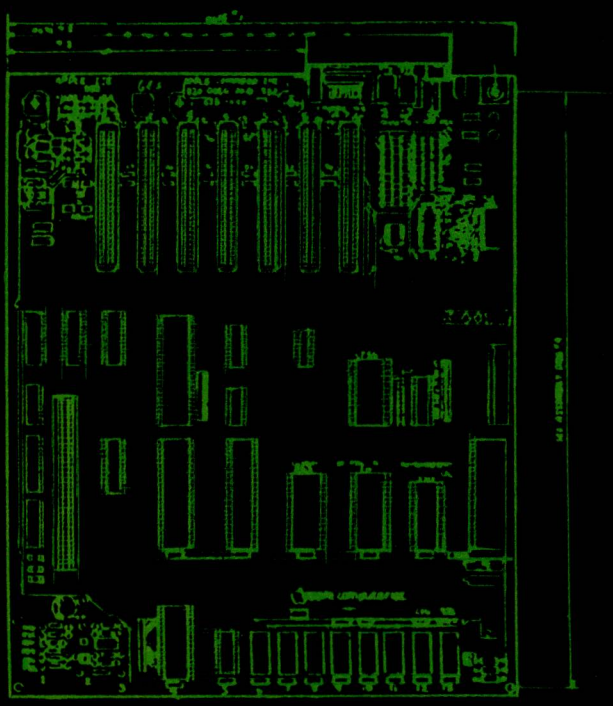

MOTHER BOARD

And bear in mind, the IIe still has all those other virtues that made the Apple II so very popular. Including access to more accessories, peripheral devices and software than any other personal computer you can buy.

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So either visit one of our many authorised dealers, and see the newest Apple for yourself.

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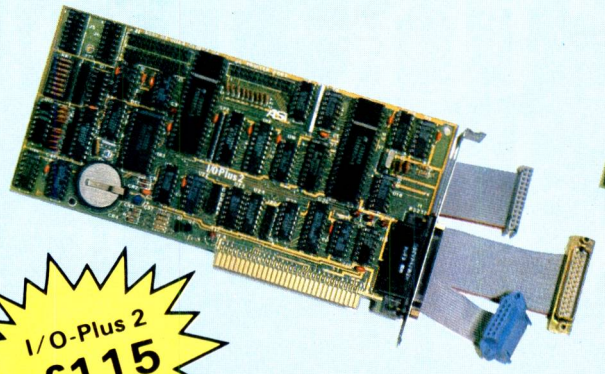
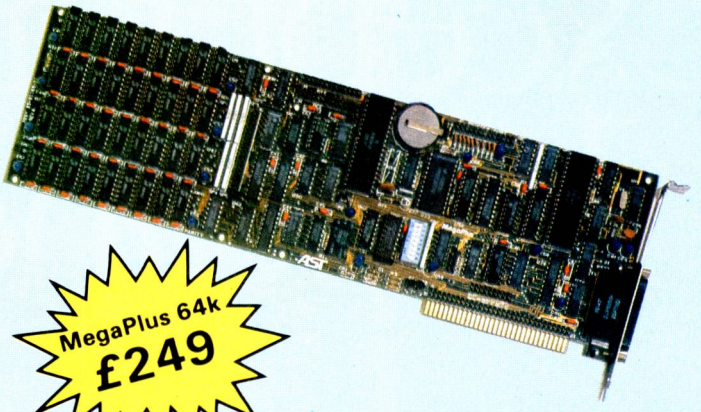


I/O-Plus 2
£115



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

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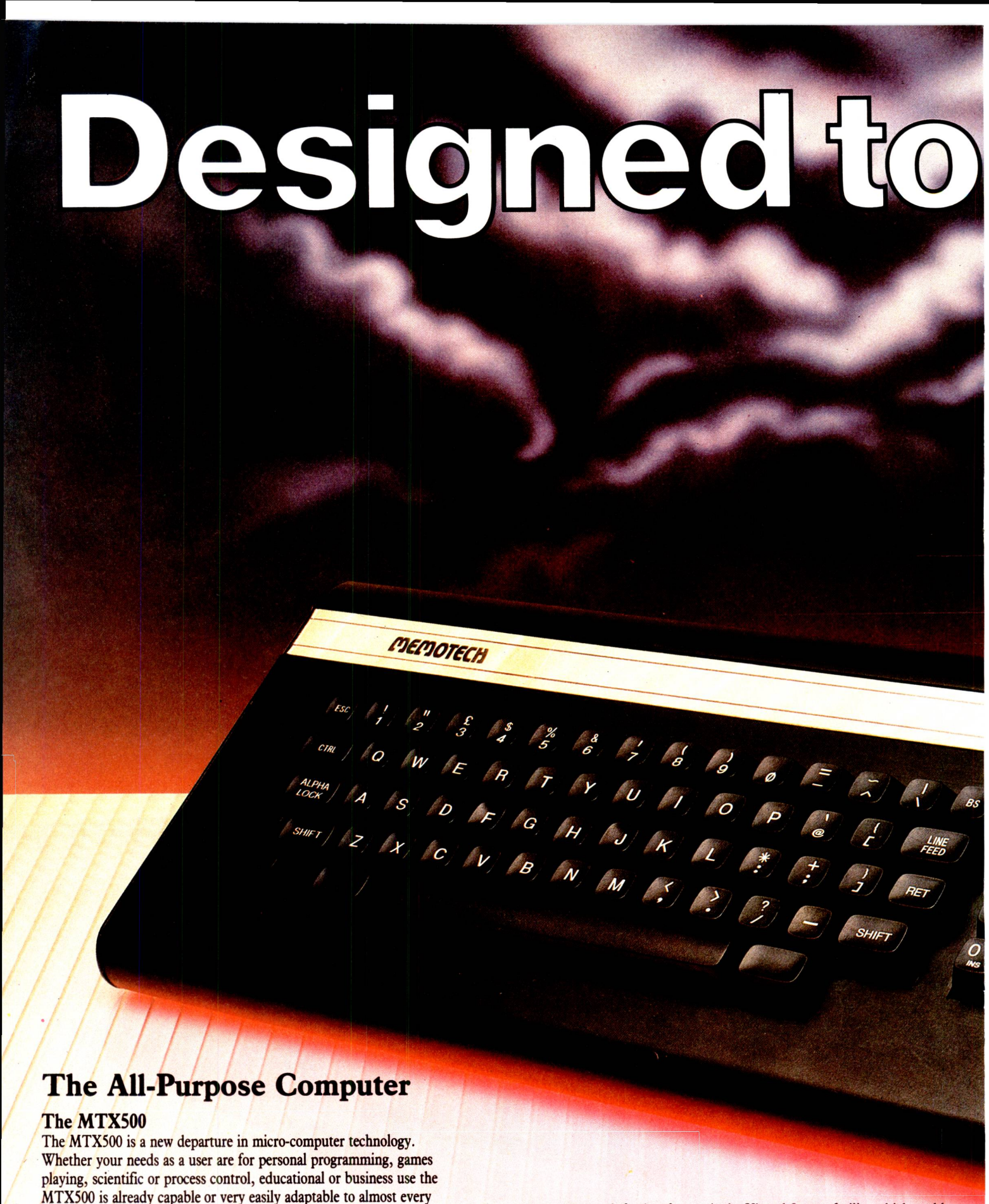

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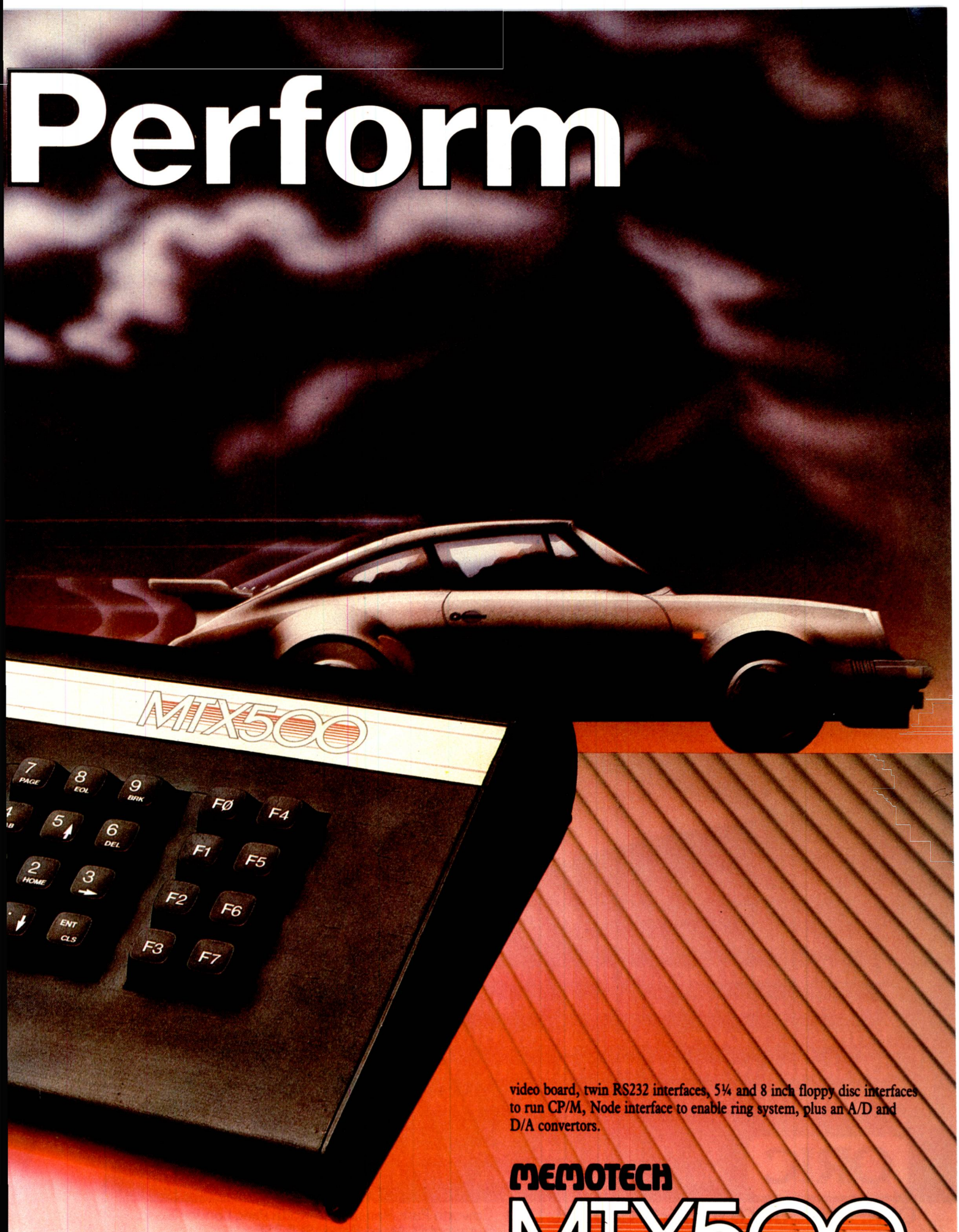
Hardware

As standard – 32k of user RAM expandable to 512k plus 16k of dedicated video RAM. Sixteen colours, 40 column text, 256 × 192 high resolution graphics with all sixteen colours available and easily moveable user defined graphics (Sprites) combine to make effective screen displays quick and simple to achieve. Standard outputs are centronics printer

Perform



port, two joystick ports, an uncommitted I/O port, 2400 Baud Cassette port, separate TV and Video Monitor ports, 3 voice sound with hifi output plus a dedicated games cartridge port. Other standard features include the Z80A processor running at 4MHz, real time clock, full moving key keyboard with 79 keys including eight function keys and separate numeric pad. Optional expansions include 80 column colour video board, twin RS232 interfaces, 5¼ and 8 inch floppy disc interfaces to run CP/M, Node interface to enable ring system, plus an A/D and D/A convertors.

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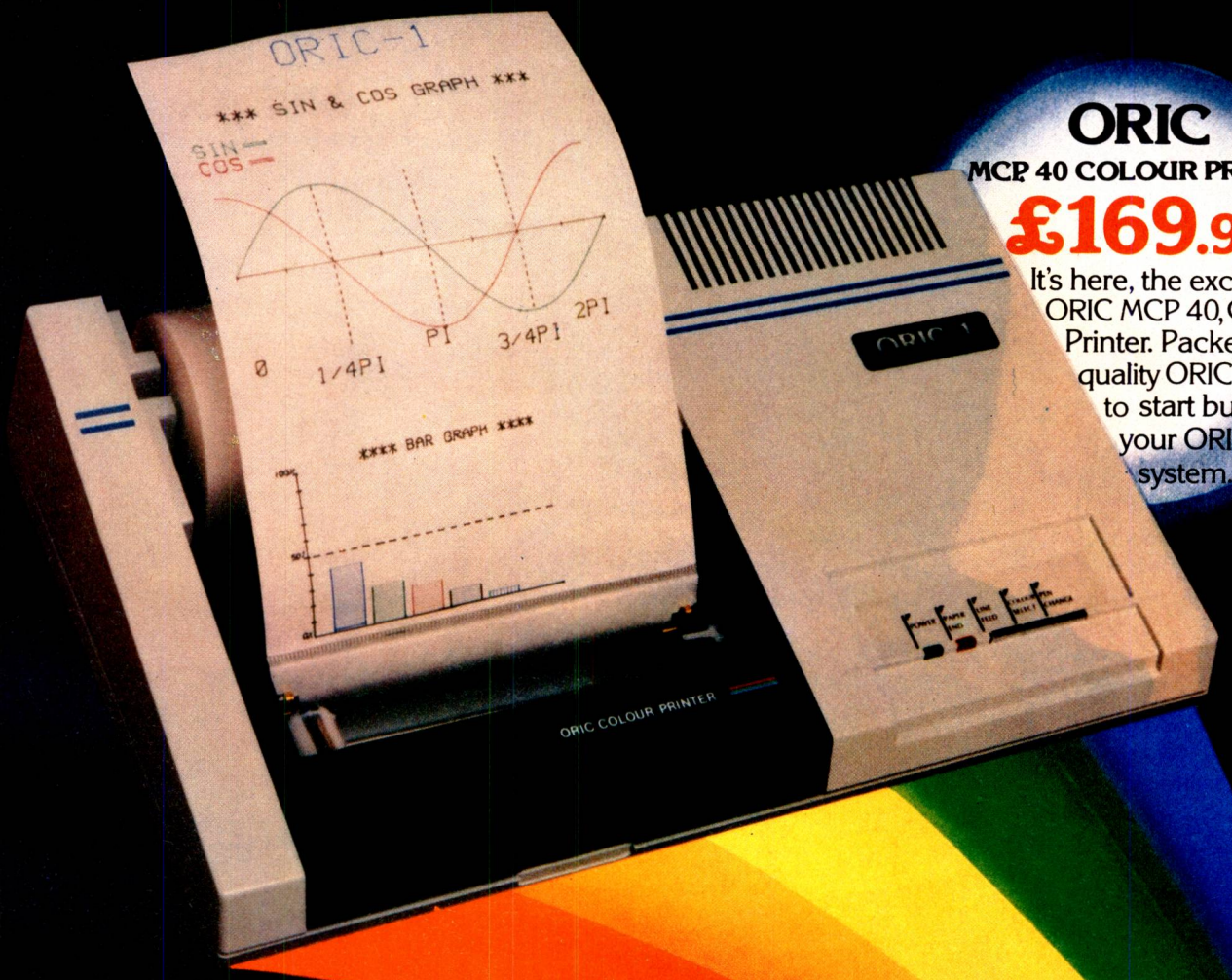

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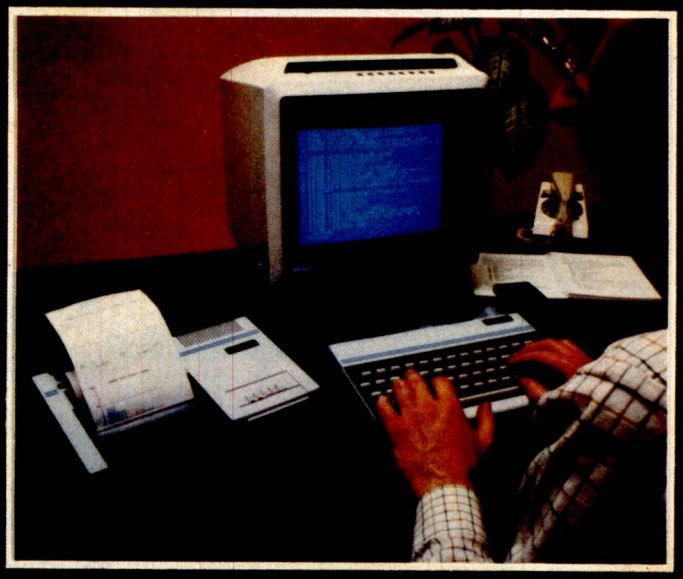

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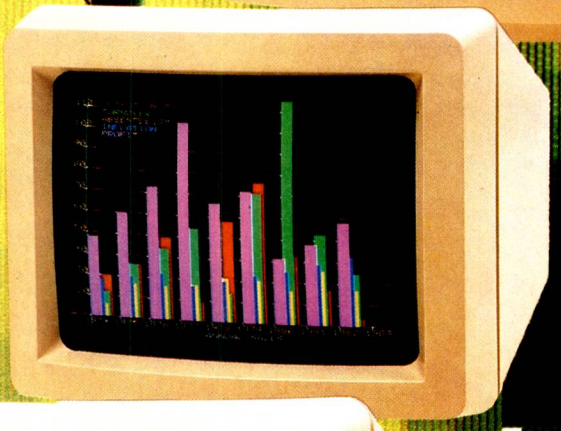

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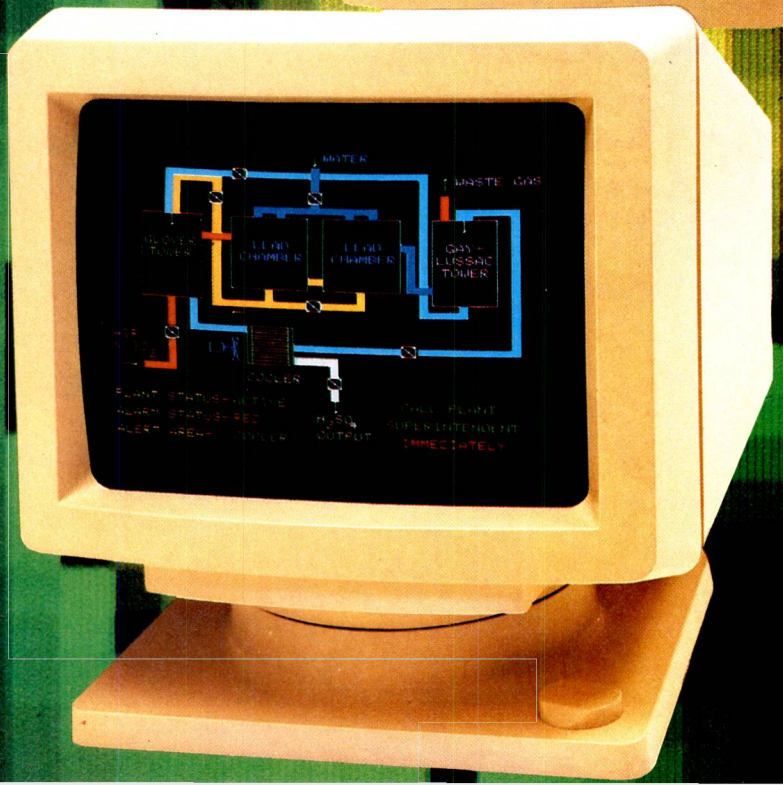

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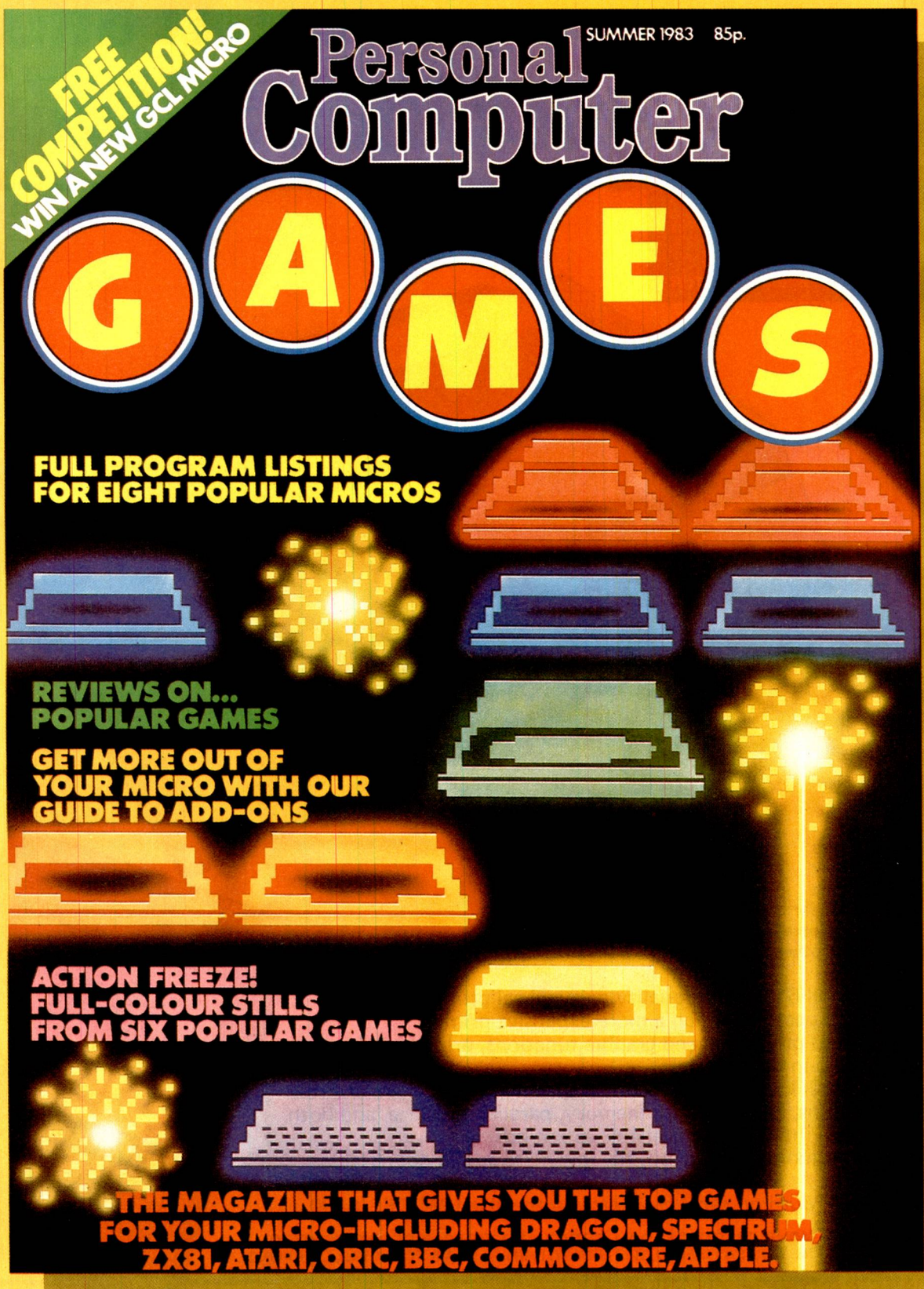

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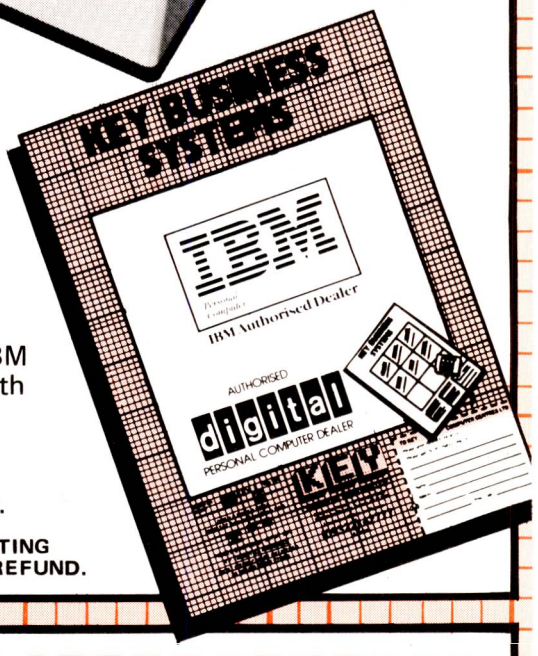
★ "Drop in" Daisywheel Triumph Adler compatible

★ IBM Selectric Ribbon

★ Compatible Centronics Interface and Industry standard control codes makes the 6100 ideal for: BBC, Dragon, Oric, Apple, Newbrain, Sirius and others.



The new Juki model 6100 letter quality daisy wheel printer has full features you'd expect to find on a more expensive printer.

It can support word processing and graphic functions, print 18CPS, and use a simple drop-in daisy wheel.

The 6100 has 10/12/15 pitch, proportional spacing, utilizes standard IBM Selectric typing ribbons, has 2K buffer memory, parallel interface, and both tractor feed and serial interface are available as options.

That's only the beginning. Best of all, the low-noise Juki model 6100 is extremely reliable.

You can pay more, *but you can't buy better* — the JUKI MODEL 6100.

NO DELAY – TELEPHONE YOUR CREDIT CARD No. TODAY AND YOU CAN START PRINTING TOMORROW, AND IF YOU'RE NOT SATISFIED, RETURN WITHIN 14 DAYS FOR A FULL REFUND.

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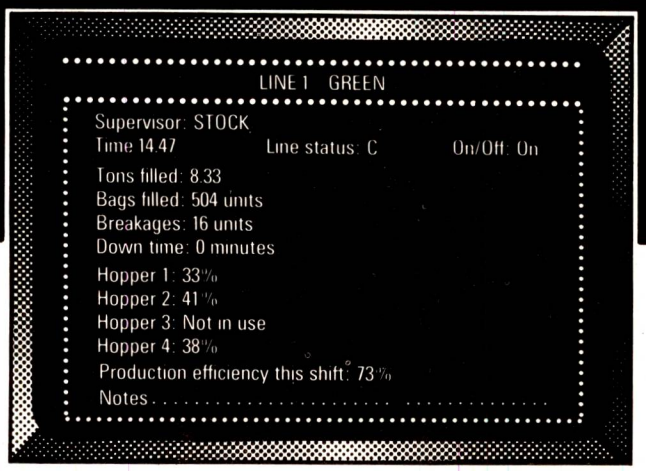
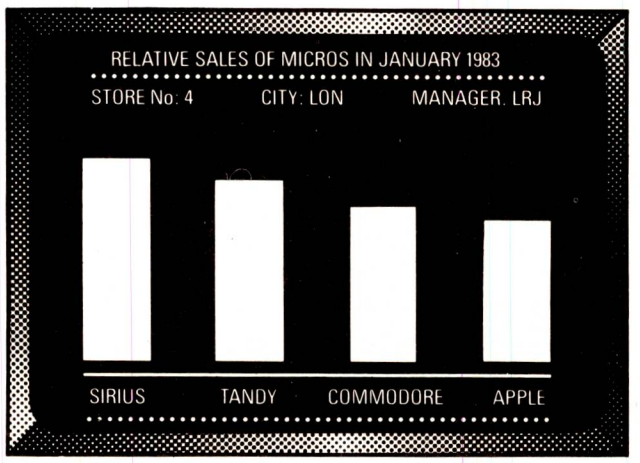
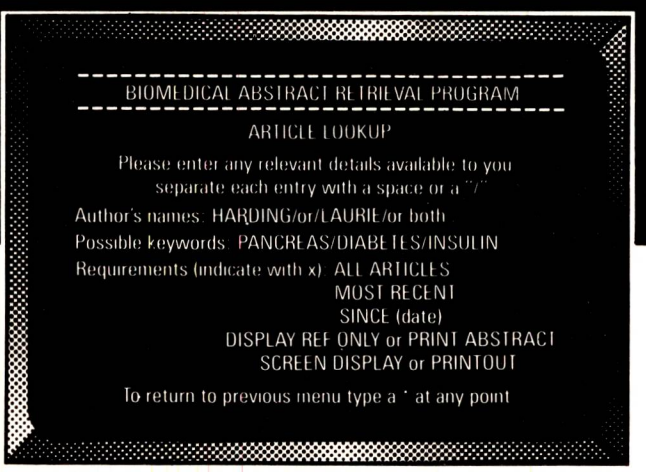


Controlling the production of tomato grow bags may sound simple enough, but co-ordinating *all* the different aspects on a brand-new production line was not without its headaches. When the production manager turned to the company's new micro for an answer, it was **THE LAST ONE** which made it possible to create a system in hours rather than months. **TLO** then went on to produce over *one hundred* individual solutions for this company in a period of less than a year.



A simple, moving, graphic display was needed by a major computer retailer to demonstrate how a new product line could maintain compatibility with some of his earlier machines. Half an hour's work with **THE LAST ONE** and he had a program displaying bar-charts, graphs and printouts. Little more than an hour later the same program was up and running on three other makes of micro. When asked what made the four machines compatible, he laid the credit squarely with **THE LAST ONE** – "some manufacturers would be hard put to even use the same mains plug – **TLO** at least gets them all speaking the same language."



The biochemistry department of a major Scottish university had a need for a filing system which could store details of abstracts of biochemical articles and which would allow retrieval of relevant material through entry of key words alone. A massive database had to be implemented on an Apple II computer and retrieval times needed to be measured in seconds not hours. **TLO** did it and the solution has since been widely published for use on other machines.

Using a computer to solve a complex problem is not always as easy as it sounds.

One solution that has helped solve hundreds of problems in installations throughout the world is THE LAST ONE (TLO).

A glance through the three examples on this page will give you some idea just how versatile TLO is.

TLO runs on the Apple II and IIe, Commodore 4032 and 8032/96, TRS-80 Model II (TRSDOS or CP/M), most CP/M, CP/M 86 and MS-DOS machines including the IBM PC (PC-DOS) and Sirius.

Try out TLO for £50 + VAT

A limited demonstration version of TLO is now available for just £57.50 including full documentation, VAT, postage and packing. This is fully refundable against purchase of the full version.

Find out what TLO can do for you by sending today for a free information pack. It could be the solution to hundreds of *your* problems.

THE LAST ONE™

D.J. 'Al' Systems Ltd., Dept E, Station Road, Ilminster, Somerset, TA19 9BQ. Telephone: Ilminster (04605) 4117.

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Apple II Europlus 48K Computer	~~649.00~~	**599.00**

ATARI

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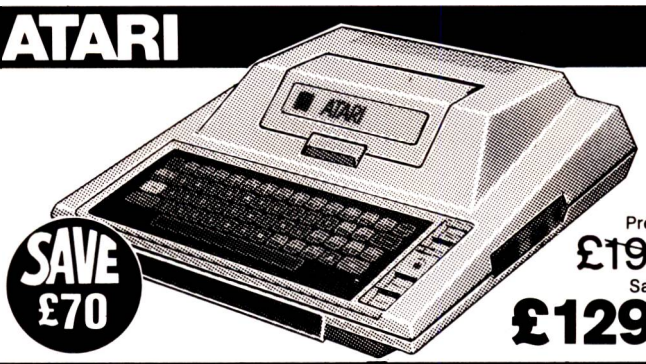
Atari 822 Printer	~~249.00~~	**179.00**
Atari 810 Disk Drive (only compatible with Atari 800).	~~329.00~~	**279.00**



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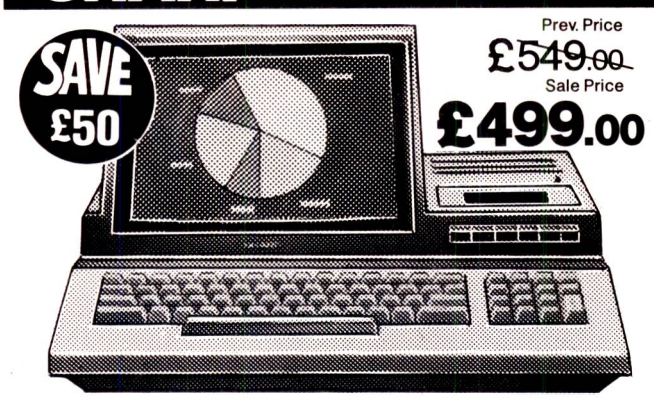

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Sharp MZ80 P5 Printer	~~379.00~~	**339.00**
Sharp MZ80 SFD Disk Drive	~~449.00~~	**399.00**
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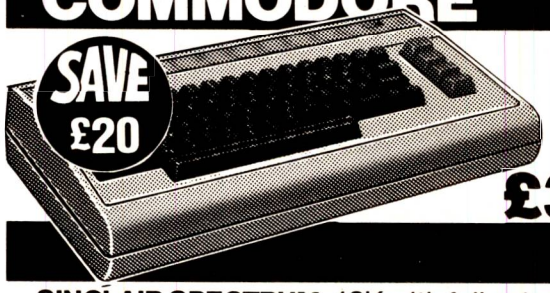
COMMODORE



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Prev. Price £~~169.90~~
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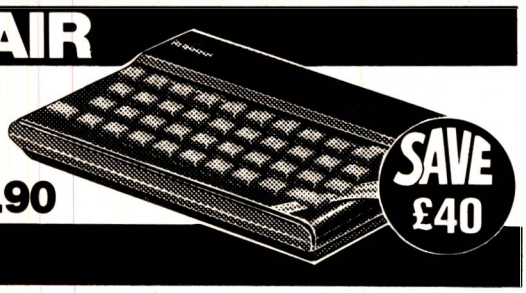
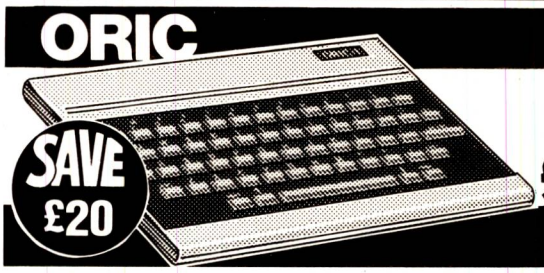


ORIC



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Some of these models shown need a separate TV or monitor. Micropoint has a complete range of suitable models from £59.90 (B/W) or £198.90 (Colour).

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If you're looking to upgrade your computer, come to us first as we are often willing to take good quality used equipment in part exchange.

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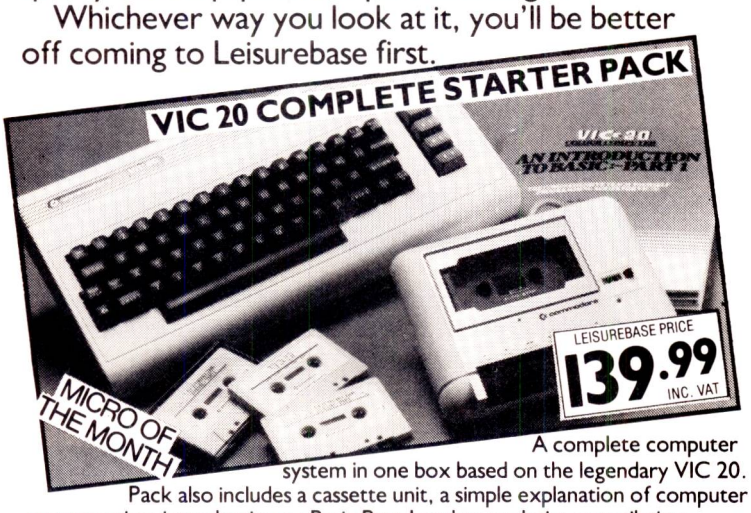

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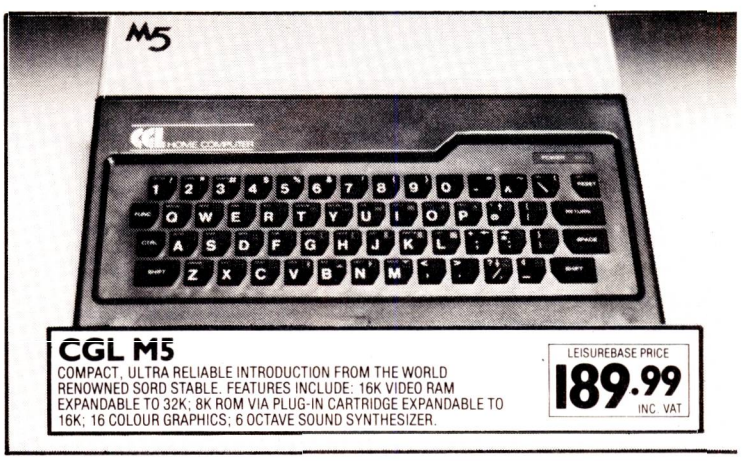

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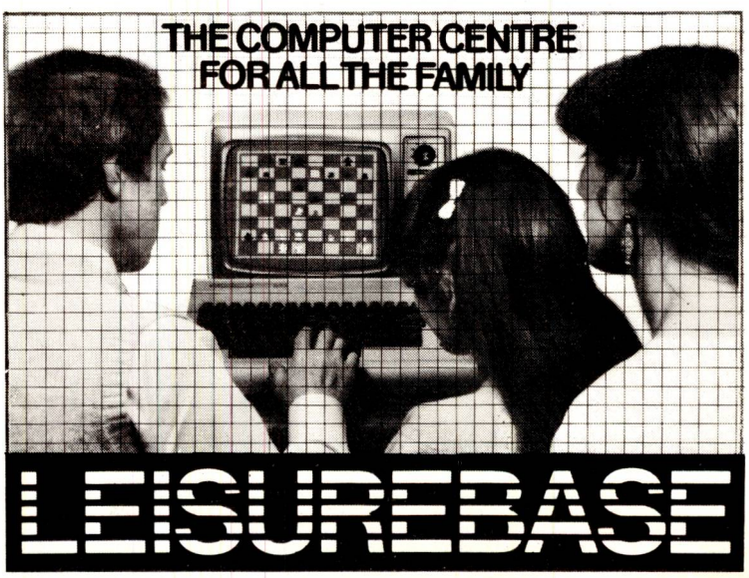

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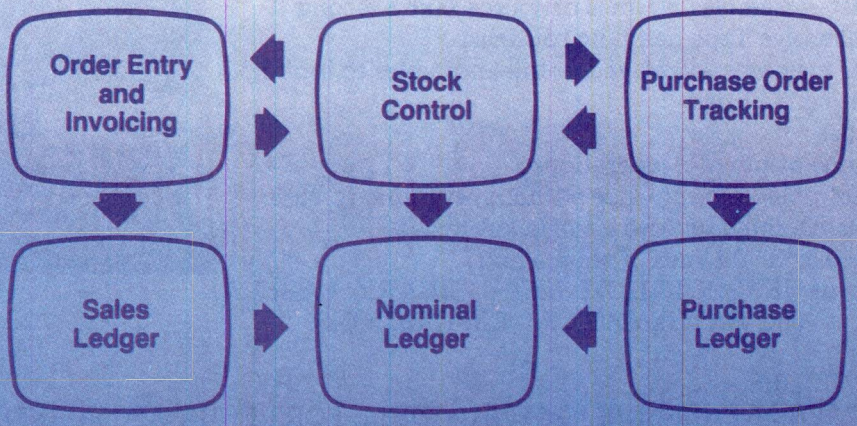

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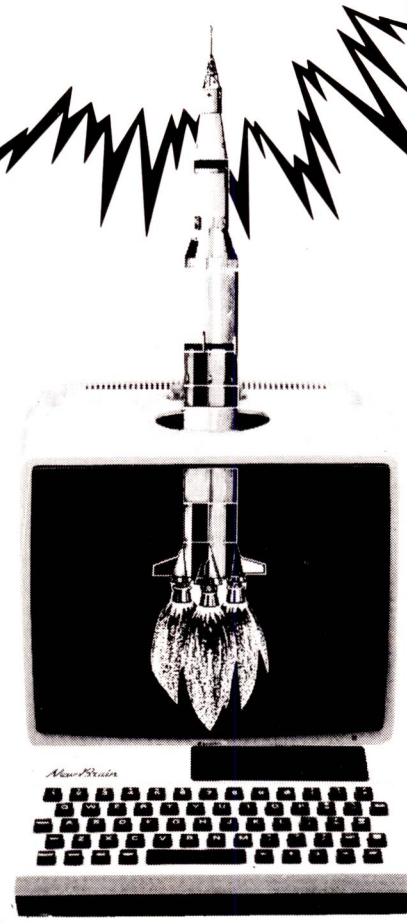

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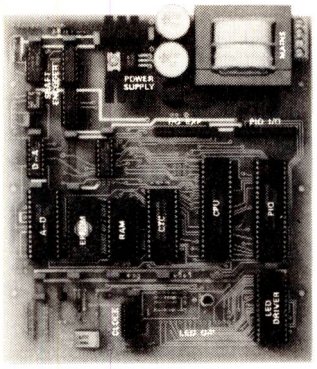

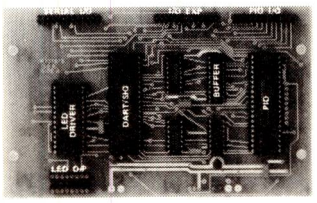

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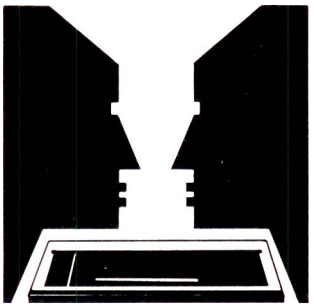

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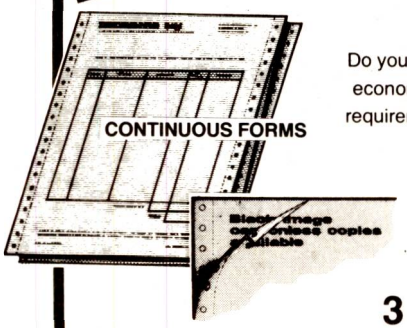

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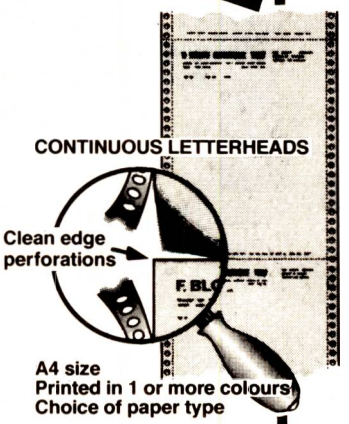

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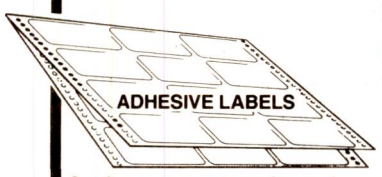

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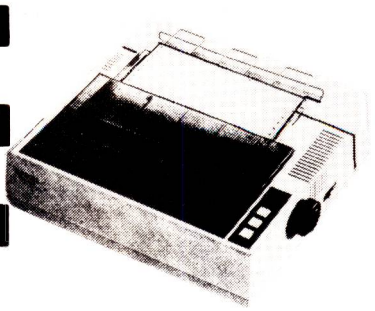

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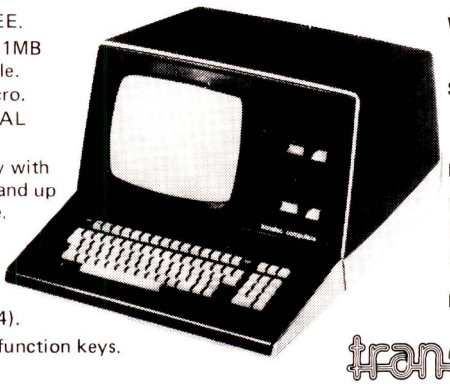

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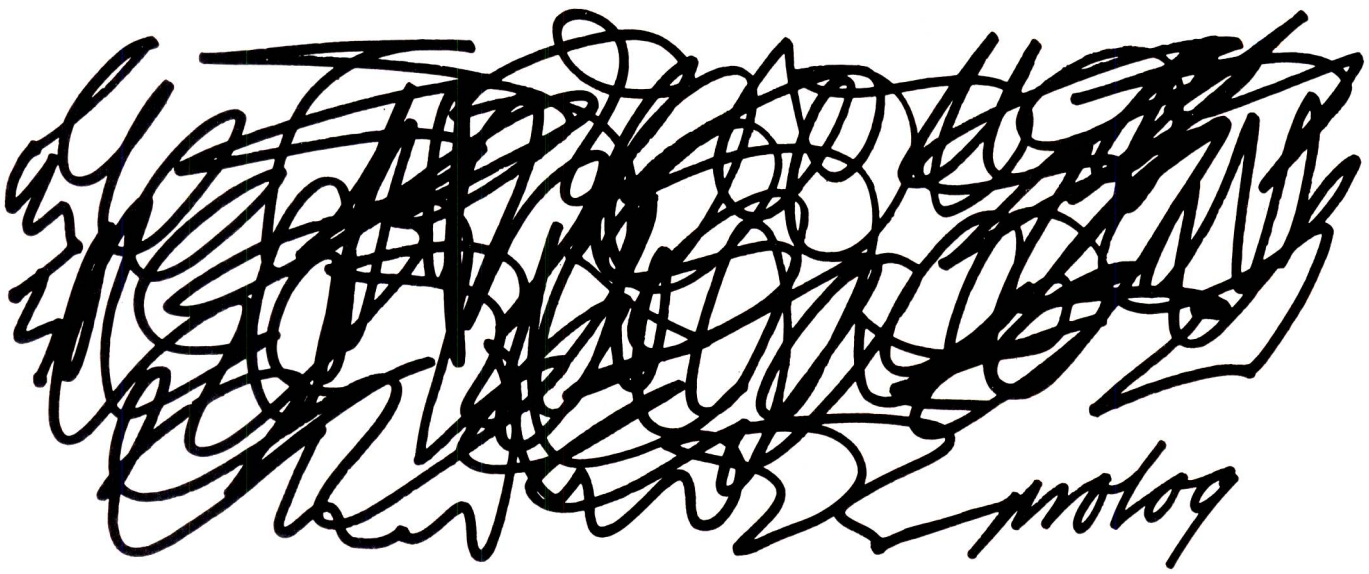

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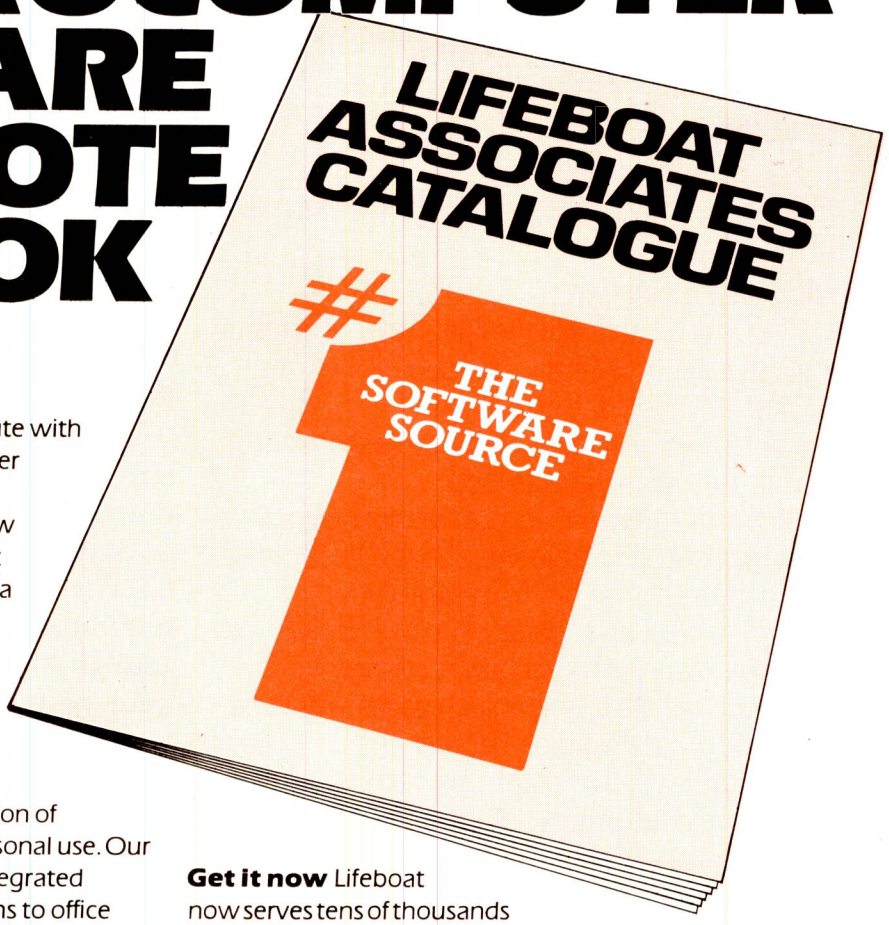

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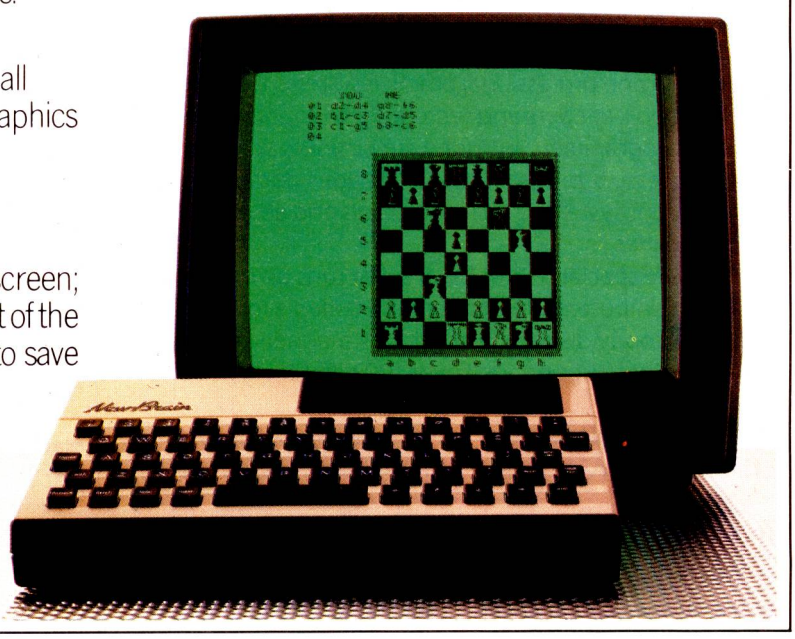

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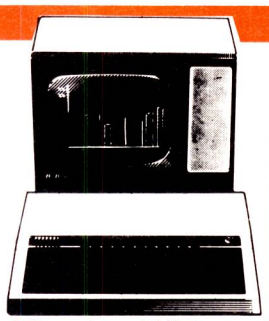

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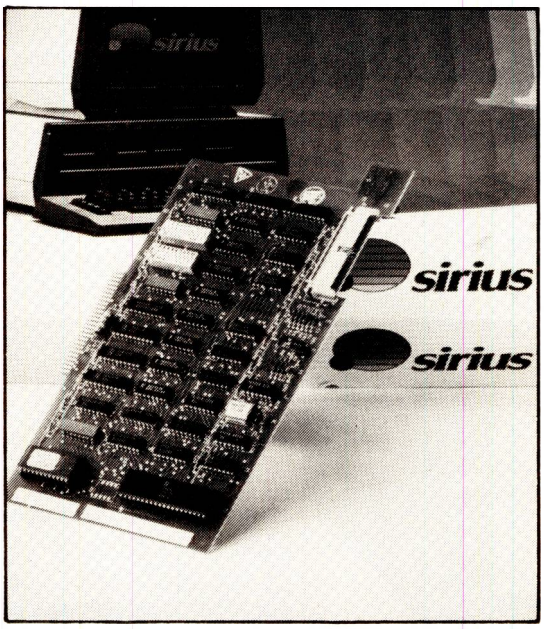

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		CP/M-80	CP/M-86	PC-DOS
WORDSTAR	MicroPro	□	●	*
MAILMERGE	MicroPro	□	●	*
SPELLSTAR	MicroPro	□	●	*
EASYWRITER II	IUS			*
EASYSPELLER II	IUS			*

Data Bases And File Management Systems

		CP/M-80	CP/M-86	PC-DOS
CARDBOX	Caxton	□		*
DATASTAR	MicroPro	□		*
dBASE II	Ashton-Tate	□	●	*
EASYFILER	IUS			*
INFOSTAR	MicroPro	□		*
PERSONAL PEARL	Pearl Software	□	●	*
REPORTSTAR	MicroPro	□		*
RESCUE	MBS	□		*
TIM III	Innovative S/w			*

Business Systems. Financial Planning. Accounting

		CP/M-80	CP/M-86	PC-DOS
CALCSTAR	MicroPro	□		*
EASY PLANNER	IUS			*
MICRONET	Abtex	□		
MULTIPLAN	MicroSoft	□		
SAPPHIRE MARS	Sapphire Systems	□	●	
SUPERCALC	Sorcim	□	●	*
MILESTONE	Organic Software	□	●	
GBS (General Business System)	ByteSoft	□		
ISL (Integrated Stock & Ledger)	ByteSoft	□		

Statistics

		CP/M-80	CP/M-86	PC-DOS
MICROSTAT	Ecosoft	□		*

Training Packages

		CP/M-80	CP/M-86	PC-DOS
HANDS-ON BASIC	MicroCal	□	●	
HANDS-ON CP/M	MicroCal	□	●	
HANDS-ON COBOL	MicroCal	□	●	
WP WORKSHOP	MAC	□	●	
FLIGHT SIMULATOR	MicroSoft	□	●	*

Languages

		CP/M-80	CP/M-86	PC-DOS
BASIC COMPILER	MicroSoft	□		
BASIC INTERPRETER	MicroSoft	□		
BAZIC	MicroMikes	□		
C COMPILER	Digital Research		●	
CBASIC	Digital Research	□	●	
CBASIC COMPILER	Digital Research	□	●	*
CIS COBOL	MicroFocus	□	●	
COBOL	MicroSoft	□		
FORTRAN	MicroSoft	□		
LEVEL II COBOL	MicroFocus	□	●	
MULISP/MUSTAR	MicroSoft	□		
MUMATH/MUSIMP	MicroSoft	□		
PASCAL/MT+	Digital Research	□	●	*
PASCAL/MT+ & SPP	Digital Research	□	●	
PERSONAL BASIC	Digital Research		●	
PL/I	Digital Research	□	●	*
XBASIC	Xitan	□	●	

Programming Tools (inc. Cross Assemblers)

		CP/M-80	CP/M-86	PC-DOS
ACCESS MANAGER	Digital Research	□	●	
ANIMATOR	MicroFocus	□	●	
AUTOCODE (for dBASE II)	Stemmos	□	●	
EDIT	MicroSoft	□		
BT-80	Digital Research	□		
DISPLAY MANAGER	Digital Research	□	●	*
FORMS 2	MicroFocus	□	●	
MACRO	Microsoft	□		*
PROGRAMMERS UTILITIES	Digital Research	□	●	*
QUICKCODE (for dBASE II)	Fox & Geller	□		*
SID	Digital Research	□	●	
SPP	Digital Research	□	●	
WORDMASTER	MicroPro	□	●	
XASM18 (1802)	Avocet	□		
XASMF8 (F8/3870)	Avocet	□		
XASM65 (6502)	Avocet	□		
XASM68 (6800/01)	Avocet	□		
XASM48 (8048/8041)	Avocet	□		
XLT86	Digital Research	□		
ZSID	Digital Research	□		

Operating Systems

		CP/M-80	CP/M-86	PC-DOS
CP/M	Digital Research	□	●	
CP/M PLUS	Digital Research	□		
CP/NET & CP/NOS	Digital Research	□		
MP/M II	Digital Research	□	●	
CP/M-86 (IBM PC)	Digital Research		●	
CONCURRENT CP/M-86(IBM PC)	Digital Research		●	

Utilities

		CP/M-80	CP/M-86	PC-DOS
COPYALL	MicroMikes	□		
DESPOOL	Digital Research	□		
DUTIL (for dBASE II)	Fox & Geller	□		
FILESHARE	MicroFocus	□		
FILESTAR	MicroSec	□		
MUCOPY	Wheatcroft Hards	□		
SORT	Microsoft	□		
SUPERSORT	MicroPro	□	●	
SUPERVYZ	Epic	□		
SDISK (Silicon Disk)	Xitan	□		

Communications

		CP/M-80	CP/M-86	PC-DOS
BSTAM	Byrom Software	□	●	*
BSTMS	Byrom Software	□		

Graphics

		CP/M-80	CP/M-86	PC-DOS
DGRAPH (for dBASE II)	Fox & Geller	□		
FASTGRAPHS	Innovative S/w			*
GSX	Digital Research	□	●	
GSS- Kernel	Digital Research	□		
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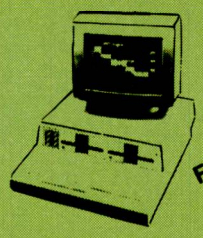

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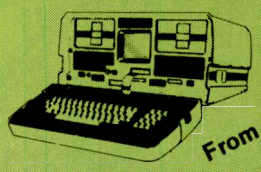

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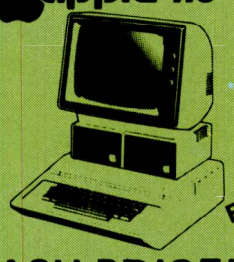

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System Specification

Hardware Facts

CPU	Z80A, CTC, PIO, SIO, 4MHz
MEMORY	128K Random access memory 2K Video RAM 4K Systems Monitor ROM expansion to 12K 4K Character ROM
VIDEO	10 inch (24cm) Phosphor Green display High pixel resolution Inverse, half intensity, underlining video attributes
REAL TIME CLOCK	Integral real time clock/calendar with battery backup allowing disc entries to be time/date stamped
GRAPHICS	Teletext Graphics set Custom graphics set 160 x 72 pixel resolutions
COMMUNICATIONS INTERFACE	RS232C Serial i/o Centronics parallel interface
KEYBOARD	Low profile, 67, 87 or 107 keys Programmable function keys QWERTY or AZERTY
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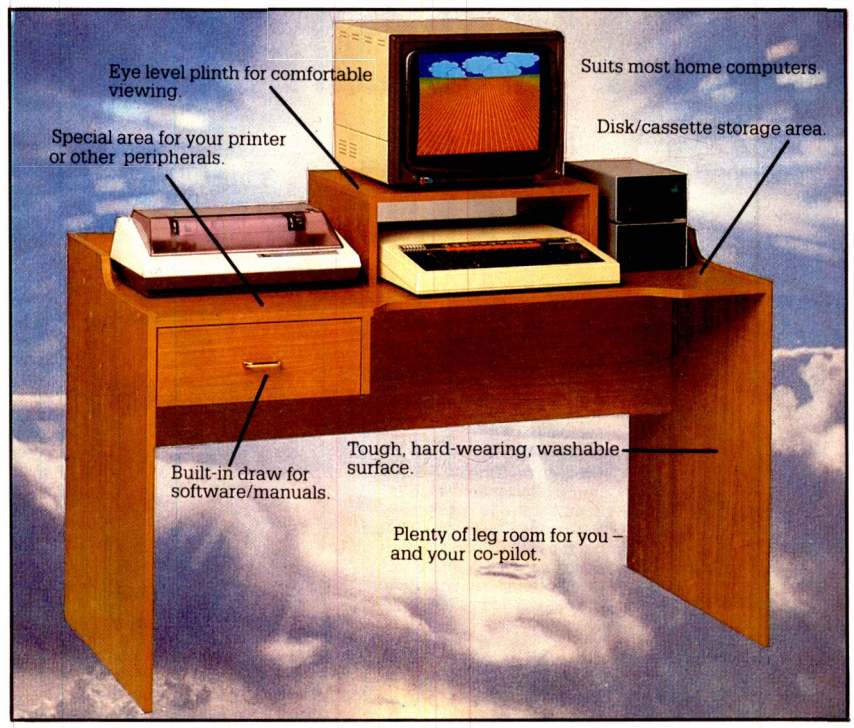

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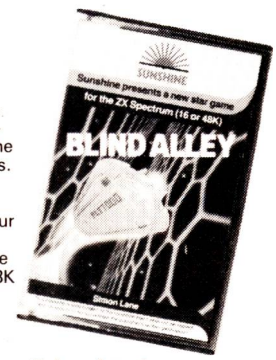

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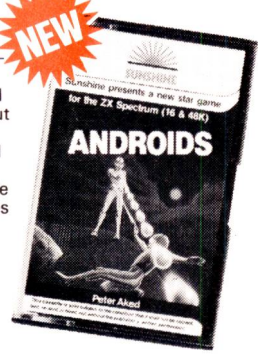



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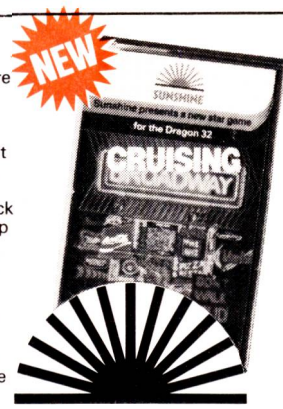

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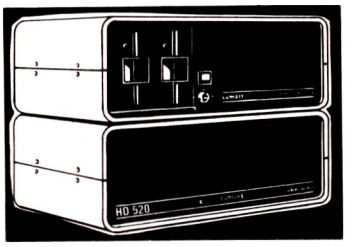

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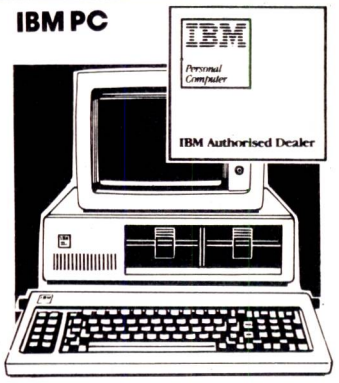

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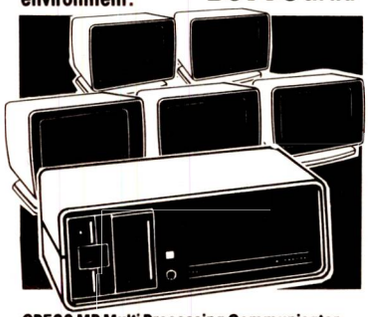

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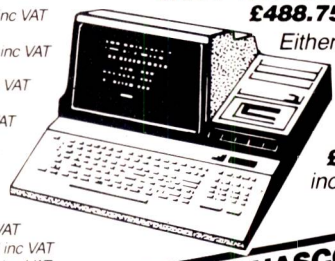

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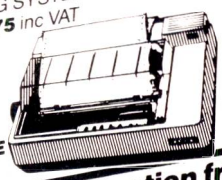

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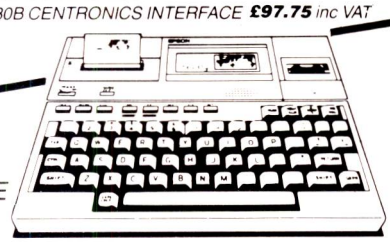

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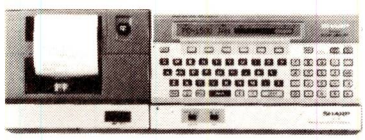

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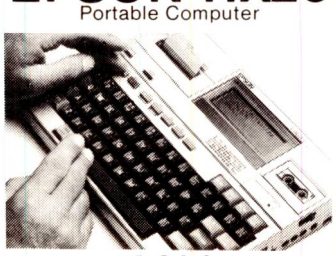

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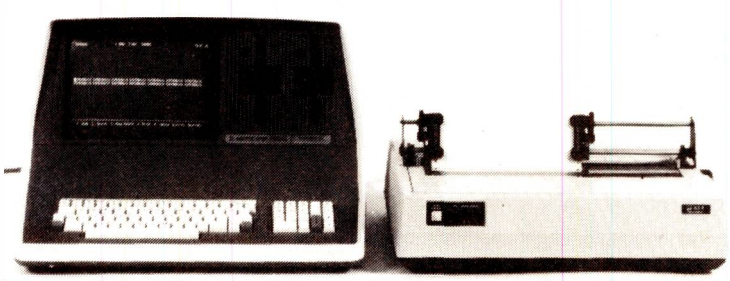

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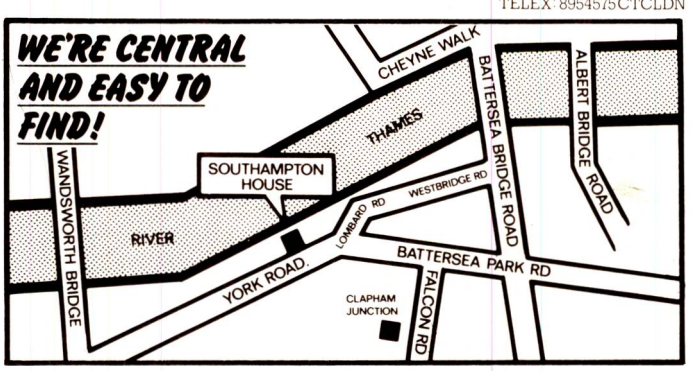

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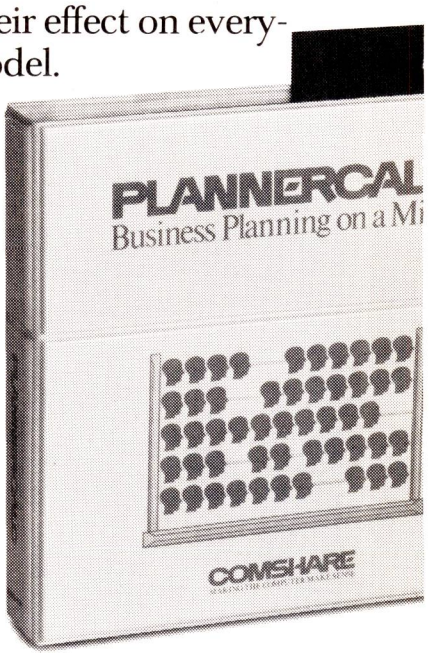

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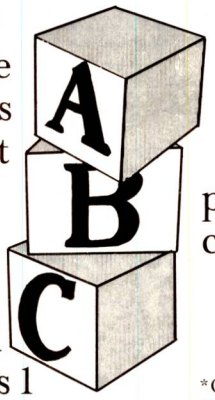

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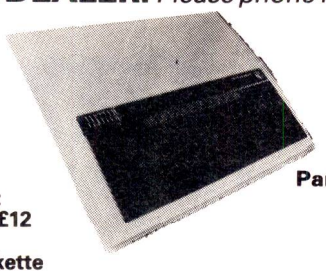

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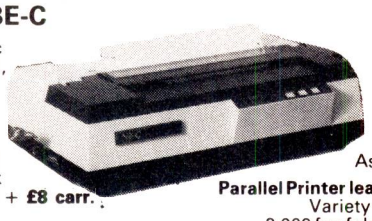

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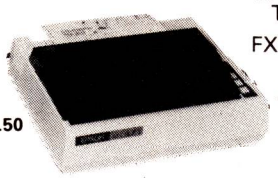

RX80 100CPS 80col Tractor Feed **£298**
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26 way	175p	150p	240p
34 way	200p	160p	320p
40 way	220p	190p	340p
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Single End	145p	165p	240p	380p
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16 pin	50p	140p
24 pin	100p	200p
40 pin	200p	225p

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8251	250p
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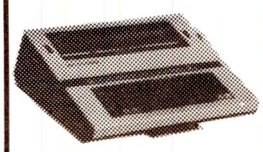

SILVER REED EX 44 portable typewriter with serial interface, 9-12 CPS, 2000 character buffer, selectable baud rates from 50 to 9600 baud, External 6000 character memory option with true decimal tab, all the features youd expect from the latest in electronic self correcting typewriter technology, and space-age looks - silver/grey with tinted transparent cover. Others advertise the same printer for £480.00.

Our special price **£450.00**

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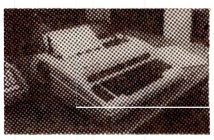

OLYMPIA ESW COMPACT. Smart daisywheel typewriter and computer printer 10, 12, 15, C.P.I., 14 CPS, Serial or Centronics interface, optional 64 and 128K buffers.
Normal price £498.00. Our price . **£485.00**
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It can support word processing and graphic functions, print 18CPS, and use a simple drop-in daisy wheel.
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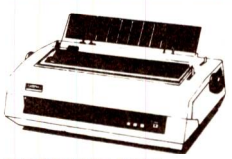

BROTHER HR-1 You can now buy a superior daisywheel printer for a price only previously associated with dot matrix models.
The Brother HR is an enticing addition to your system. It has a print speed of 16 CPS, range of 8 typefaces, and a choice of two models with either parallel or RS232 interfaces.
Reliability, durability and attractive appearance make the Brother HR-1 probably the best printer at this price.
Our Price **£645.00**

BROTHER HR-1
Daisywheel Printer

RICOH RP 1300 37 CPS. Heavey duty construction. Advanced design. Fully automatic bidirectional logic - seeking print. Proportional spacing, bold facing, graphic effects and other print enhancements under software control. Compatiable with the best word processing packages available. Choice of interface, Serial, Parallel or IEEE. 8K buffer standard. Easy to change wheels and ribbons - 10 seconds for both. Unique 'double daisywheel' includes all standard ASCII, and 30 additional characters. Multicopies, original plus 6 copies.
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RICOH RP 1600 As above but faster 60 CPS.
Our price **£1589.00**

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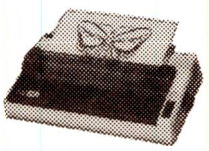

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SPECIAL PRICE **£269.00**
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SPECIAL PRICE **£369.00**
RS232 INTERFACE FOR ABOVE **£50.00**

SHINWA CTI-CP80 80 CPS Bi-directional logic seeking. 10" carriage 80 columns, friction and adjustable tractor feed. Patented square needles up to 9 x 13 matrix. Hi-res graphics and block graphics. Parallel interface code compatible with epson.
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EPSON RX80: 80 column, 100 CPS, normal, italic and elite characters, 11 international character sets, hi-res bit image printing, bi-directional logic seeking, 4" to 10" adjustable pin feed, Centronic parallel interface. Normal price £289.00.
Our special price **£259.00**

EPSON FX80: 80 column, 160 CPS, normal, italic and elite characters, 256 user definable characters, superscript, subscript, 11 x 9 matrix, bi-directional logic seeking, hi-res bit image printing (960 x 8 dots/line), friction and pin-feed, 9 international character sets, Centronic parallel interface. Normal price £438.00
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EPSON MX-100 136 column, 100 CPS, friction and tractor feed, up to 15" adjustable carriage, hi-res bit image printing, true descenders, Centronic parallel interface. Normal price £499.00
Our special price **£419.00**

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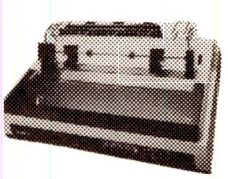
APPLE INTERFACE (Non-graphics) + cable **£49.00**
APPLE INTERFACE (Graphics) + cable **£57.00**
TRS 80 INTERFACE **£22.00**



HERMES 612C 'Daisy quality matrix printer'. 18 needle ruby printhead. Data speed - 400 CPS. Draft speed - 200 CPS. Word processing - 100/120 CPS. Multi-mode Hi-res graphics. For character sets and eight national versions as standard. Friction and tractor feed. Proportional spacing. Optional sheet feeder. Probably one of the best quality printers available. Normal price £1950.00
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PRINTER CABLES

OSBORNE PRINTER CABLE (RS232) **£35.00**
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MONOCHROME MONITORS

All units supplied with free connecting cables.



KAGA 12" High Res. Green **£109.00**
KAGA 12" High Res. Amber **£129.00**
BMC 12" High Res. B & W or Green **£109.00**
Zenith 12" High Res Green includes an external 40/80 character switch..... **£89.00**

MICROVITIC COLOUR MONITORS

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14" 1431 Std Res. Link selectable TTL or liner 0-4V into 1500 OHMS **£245.00**
14" 1431 Med Res. Otherwise as above **£369.00**
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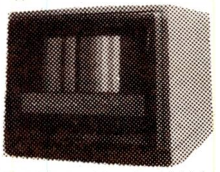

FOR IBM PC

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FOR THE SPECTRUM

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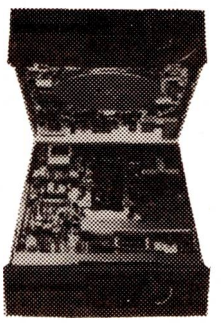

The following 5.25 inch disc drives based on Teak, Cannon and Mitsubishi units, will work with the BBC, TRS 80 model III, Nascom, Superbrain, Heathkit, Video Genoe, Atom and other Shugart SA400 compatible computers. Colours match BBC micro.
FULL HEIGHT 40 track single sided drive with cabinet and power supply. Single (100K) ..... **£189.00**, Dual (200K) **£359.00**

½ HEIGHT 40 track single sided drive with cabinet and power supply, single (100K) ..... **£190.00**, Dual (200K) **£360.00**

AS ABOVE but 40 track double sided. Single (200K) **£259.00**

Dual (400K) **£480.00**

AS ABOVE but 80 track double sided. Single (400K) **£339.00**
Dual (800K) **£610.00**

½ HEIGHT 80 track single sided drive with cabinet and power supply.
Single (200K) **£255.00**
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Single(400K) **£329.00**
Dual (800K) **£599.00**
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BBC disk manual and formatting diskette **£17.00**

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This includes DUAL (800K) disc drives, 64K RAM, Z80, 2nd processor CP/M compatible operating system (CPN). This enables you to use a range of standard business Software and other programming languages. The unit is supplied with operating Software and comprehensive manuals, (requires BBC disk interface).
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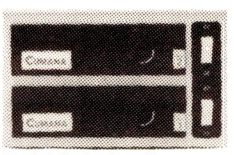
(Based on Teak and world storage technology units).
FULL HEIGHT 35 track single drive fully cased complete with interface cable **£215.00**



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TRS 80 DISC DRIVE KITS Please write for full details.

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Portability for programmability any where, built in printer, LCD Screen.
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SUPERLUXE DISK LIBRARY The SDL keeps your valuable media dust free while at the same time allows instant selection of any disk. The SDL holds 20 disks and the SDLX holds 28 disks. They come boxed with full instructions and labelling. SDL ..... **£10.95** SDLX **£12.95**
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These buffers allow you more time with your computer by storing the incoming data and then liasing with your printer leaving your computer free for further more important needs. Comes in attractive casing. 5¼" long x 5" wide x 1½" deep. Easily installed.
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The new sharp MX-700 by Graham Knight

SPECIFICATION
The MZ-700 has 64K user RAM, 4K VIDEO RAM, 4K CHARACTER GENERATOR ROM, and 4K MONITOR ROM – a total memory of 76K. The keyboard has 69 proper full stroke keys in a QWERTY layout. 5 special keys allow the user to define 10 functions. Four cursor arrow keys are on a separate pad allowing quick editing and skillful game control.

The Z-80A CPU runs at 3.6MHz giving very fast processing times (Benchmark 4 takes just 8.6 seconds). Optional extras are a 4 colour printer-plotter and a neat 1200 bps cassette. An interface for a larger Sharp printer is built in. A 50 way connector is incorporated for other peripherals. Sockets are also provided for connecting joysticks and using a separate cassette. The 8 colour display can be viewed on any TV set. Composite video and R.G.B. connectors are provided for those wishing to use a monitor.

KNIGHTS DESIGN
We have been to Sharp at Osaka, Japan three times in the last 18 months and have been closely involved in the European release of this model. Sharp originally intended to export the MZ-700 with 256 characters similar to those on the MZ-80K. We persuaded Sharp to incorporate our character generator which gives 512 characters.

Many computers have a very limited number of characters, often just 128 and sometimes with no small letters. Some micros get around this limitation by allowing the user to define shapes but this involves complex programming. Our easily programmed 512 characters include all the original Sharp shapes with the addition of "outline" letters and numbers, space invaders, rockets, planes, tanks, cars, snakes, bullets, guns, faces, gremlins, fruit, ghosts, flying Saucers, chess pieces, a TV set and the MZ-700 itself. For more serious applications we added a mass of electrical symbols including transistors, diodes, capacitors, gates, etc, plus scientific, Greek and other language characters.

All of us at Knights were involved in designing this section of the MZ-700 and we would like to publicly thank the staff at Sharp for their help and enthusiasm. It is a great honour for our British design to be incorporated in Sharp's MZ-700 export production.

EIGHT COLOURS
Many colour computers give very poor colour indeed and many micros limit the number of colours displayed at any one time. On the Sharp each of the 1,000 characters on the screen can be individually programmed for foreground and background colour. With a choice of eight colours, 512 characters, and 1,000 positions you have a fantastic possibility of 28,000,000 different colour displays. The Sharp MZ-700 colour is excellent. We have even been able to program a colour TV test card – we have never seen any other computer come close to the Sharp for colour saturation and definition.

EXTENDED BASIC
Each MZ-700 is supplied with an extended BASIC which includes commands to control the plotter-printer and peripherals. Commands include: AUTO, AXIS, CIRCLE, CLOSE, COLOUR, CURSOR, DEF FN, DEF KEY, DELETE BLOCK, GET, GPRINT, HSET, IF – ERN, IF – ERN, INP PORT, KEY LIST, LEFT$, LINE, MERGE, MID$, MODE GR, MOVE, MUSIC, ON ERROR – GOTO, ON – GOSUB, ON – GOTO, OUT PORT, PAGE, PAI, PCOLOUR, PEEK, PHOME, PLOT ON, PRINT USING, RAD, RENUMBER, RIGHT$, RLINE, RMOVE, SET, SGN, SIZE, SKIP, STR$, TEMPO, TEST, TIME$, TRACE, and WOPEN.

REVOLVING VIDEO MEMORY
The MZ-700 features a most unusual 4K video memory which stores 50 lines of characters. The screen shows a 25 line section which can be moved to show any part of the VRAM. A 50 line program listing can be scrolled round and round giving a revolving cylinder effect and this can give truly amazing screen displays in programs.

PLOTTER-PRINTER
The 4 colour plotter printer has a horizontal resolution of 480 points. It feeds the paper up and down so the vertical resolution is only limited by the length of paper. Characters can be printed in 64 different sizes from 1mm to 10cms high. Programmes can be printed in 20, 40, or 80 character per line format. Characters can be orientated in 4 directions – the right way up, upside down and sideways. The BASIC has many new commands for use with the printer-plotter allowing very complex patterns, drawings or graphs to be created easily.

CLEAN COMPUTER
Some micros have small memories and are stuck in a single language. Sharp micros are designed as "clean computers" – that means there is a maximum of RAM memory and a minimum of ROM. Languages are loaded from tape and this means that if our MACHINE CODE LANGUAGE is used the whole 64K of memory is available. Many customers progress from BASIC to FOURTH, MACHINE CODE, ASSEMBLER, or PASCAL. The ability to load different languages on tape is a most important feature.

FREE PROGRAMS
Each MZ-700 from KNIGHTS will be supplied with 4 languages and 40 programmes. The prices in brackets are what you will pay if you buy your MZ-700 elsewhere!

TEN of JAPAN'S best games – SNAKE, SPACE BEE, SEND ONE, PAINFUL MAN, LAND ESCAPE, CIRCUS STAR, SEARCHER, BATTLE, ROUND STREET, & SUPER PUCKMAN.

TEN NIGHTS PROGRAMS (£34) – CRIBBAGE, SUICIDE RUN, TEACH MULTIPLICATION, TEACH DIVISION, VICIOUS VIPER, MOTORING COSTS, STATISTICS, HOME ACCOUNTS, CRASHER, AMERICAN BOWLING
PASCAL LANGUAGE + 12 Pascal programs (£25)

MACHINE CODE LANGUAGE (£12)

FORTH LANGUAGE + 5 programs (£25)

MZ-700 PRICES
The MZ-711 desktop micro is known as the Jack in Japan – it costs £215. The MZ-721 is known as the Queen and is the model with the built in cassette – it costs £248. The MZ-731 is known appropriately as the KNIGHT and has the cassette and printer plotter built in – it costs £359. Customers outside the UK add £10 for air freight. U.K. customers get free Securicor delivery but remember to add Maggie's V.A.T.

P.S. We have sold thousands of Sharp products all over the World during the last 9 years and have never had to charge for a single repair. I wish we could find someone to supply cars on the same basis! Ring, or write for our latest newsletters and price lists.

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COMPUTERS

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

- ★Twin Z80A Processors
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- ★64K Dynamic RAM
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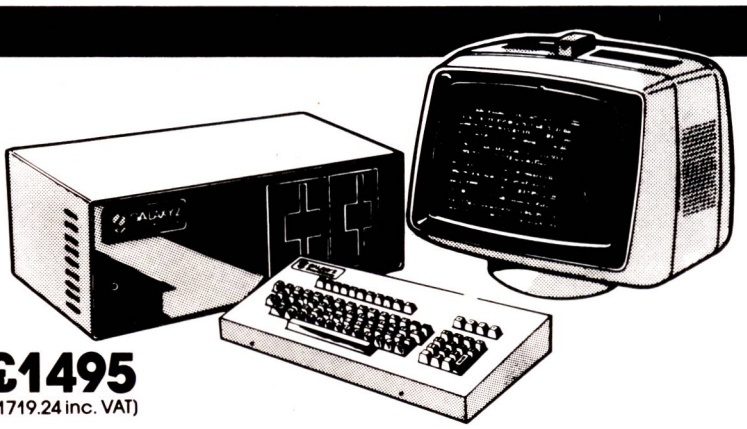

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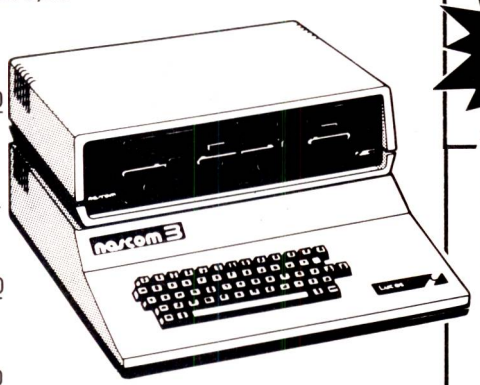

80x25 Video for nascom

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MV 256A Suitable for TV use (PAL-UHF) **£199.00** + VAT
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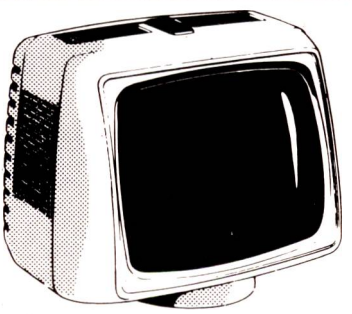

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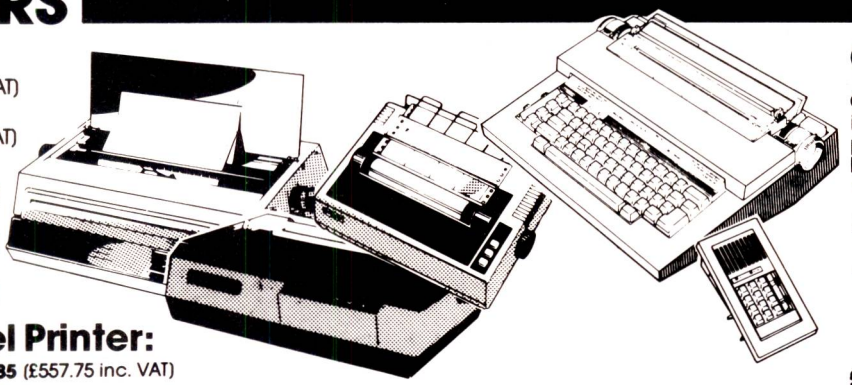

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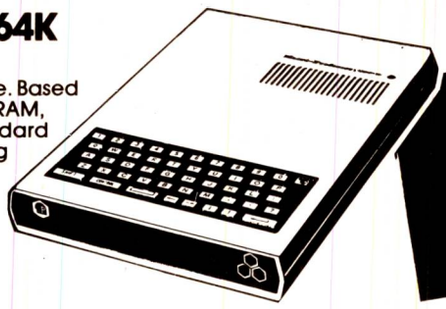

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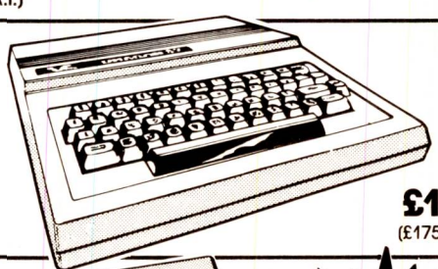

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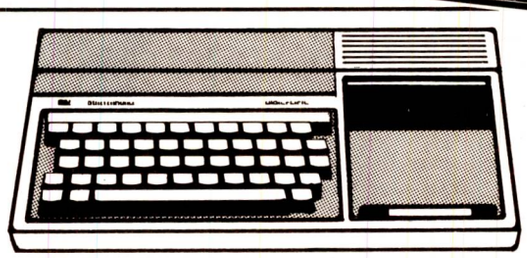

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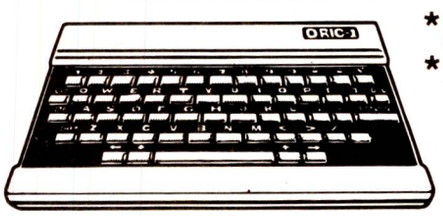

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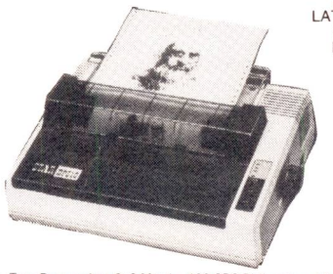

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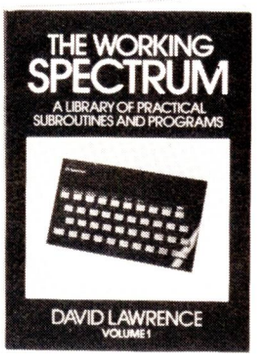

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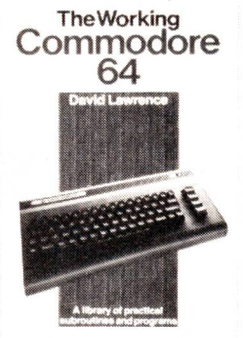
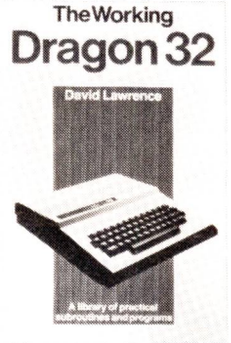
Some of the more advanced programs in this collection include a word processor and text editor, a music and sound synthesiser, a sprite editor and a program which allows you to enter high resolution graphics mode. This is not available in the standard Basic. 160pp **£5.95***





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TECHNICAL INFORMATION. LYNX 48K AND 96K

Dimensions:
Width: 345mm
Depth: 215mm
Height: 65mm

CPU/memory:
Z80A microprocessor running at 4MHz.
16K ROM (20K ROM on 96K Lynx) containing Basic interpreter and operating system.
48K RAM expandable to 96K, 128K or 192K.
Standard RAM allows 13.75K user-available in high-resolution colour graphics mode – 37.5K on 96K Lynx.
CP/M® compatibility.

Keyboard:
Standard-pitch 57-key full-action typewriter keyboard, with auto repeat on all keys. The 26 character keys have a shorthand facility, allowing single-key entry of Basic commands in conjunction with ESC key.

Display:
Bit-mapped display 248 x 256 pixels, every pixel individually addressable in eight colours. Will drive a PAL UHF colour TV set for colour display or black-and-white UHF set for mono display. Separate RGB + sync outlet for RGB monitor and composite video outlet for mono monitor. Memory expansion to 128K or 192K increases display to 248 x 512 pixels.
Full ASCII upper and lower case character set, with user-defined characters facility. Standard display is 40 characters by 24 rows, memory expansion to 128K or 192K increases display to 80 characters by 24 rows.

Graphics:
Eight colours available. Facility for colour-defining each pixel individually allows complex colour mixing. 32 standard graphics characters; additional graphics characters can be user-defined. High resolution graphics commands include INK, PAPER, MOVE, PLOT, DRAW, PRINT @, WINDOW facility allows display in defined screen area without corrupting information on the rest of the screen. Text and graphics may be freely mixed.

Sound:
Inboard speaker driven by 6-bit digital to analogue converter under software control. Output to external amplifier and for analogue control functions. Output to external speaker via cassette socket.

Cassette interface:
The Lynx is supplied with leads for connection to a cassette recorder for storage of programs and data. Operation of recorders with remote control facility is controlled by the Lynx automatically. VERIFY facility confirms that data has been SAVED successfully. APPEND allows programs and subroutines to be added to existing contents of memory.
Data transfer rate: 600–2100 baud.

Lynx Basic:
Lynx Basic is an enhanced Basic specially developed for the Lynx. It has a comprehensive range of standard Basic commands, operators and functions and has been designed for high-speed operation with the Z80A microprocessor. In addition, it contains a number of features designed to facilitate machine code programming and to make the standard Lynx Basic easy to modify. All functions, commands, keywords and syntax checking are in tables held in ROM; their pointers, however, are held in RAM so that they can be readily altered. The Lynx can be operated in 'calculator mode' at any time inside and outside programs. System features include automatic line numbering and a renumbering facility, automatic rounding, TRACE and a GOTO LABEL function which seeks out line labels, rather than numbers, to simplify programming. Facilities for machine code programming include PEEK, DPEEK, POKE, DPOKE, CODE, LCTN (identifies location of line numbers in memory), CALL, HL, RESERVE, HIMEM, INP, OUT. To aid machine code debugging there is a built-in 22-command machine code monitor. Programming statements and commands include the following:

Basic language commands:

CALL	POKE
CCHR	PRINT
CFR	PRINT @
CLS	PRINT TAB
CODE	PROC
DATA	RANDOM
DEFPROC	READ
DIM	REM
DPOKE	REPEAT
END	UNTIL
ENDPROC	RESERVE
EXT	RESTORE
FOR TO	RETURN
STEP NEXT	ROUND
GOSUB	ON/OFF
GOSUB	SPEED
LABEL	STOP
GOTO	SWAP
GOTO	TAB
LABEL	TRACE
IF THEN	ON/OFF
IF THEN	TRAIL ON/
ELSE	OFF
INPUT	WHILE
LET	WEND
OUT	
PAUSE	

System commands:

AUTO	MON
CONT	NEW
DEL	RENUM
DISK	RUN
LIST	

Mathematical and logical operators:

Symbol	Operation
**	exponentiation
–	unary minus
*	multiplication
/	division
MOD	modulo
DIV	integer divide
+	addition
–	subtraction
>	greater than
<	less than
=	equal to
<>	not equal to
>=	greater than or equal to
<=	less than or equal to
NOT	logical NOT
AND	logical AND
BNAND	16-bit binary AND
OR	logical OR
BNOR	16-bit binary OR
BNXOR	16-bit binary exlusive OR

Numeric functions:

ABS	HIMEM
ANTILOG	HL
BIN	INF
BLACK	INK
BLUE	INP
COS	INT
CYAN	KEYN
DEG	LCTN
DPEEK	LOG
EXP	LN
FACT	MAGENTA
FALSE	MEM
FRAC	PAPER
GETN	PEEK
GREEN	PI
POS	SIN
RAD	SQR
RAND	TAN
RED	TRUE
RND	VPOS
SGN	WHITE
	YELLOW

String functions:

CHR$	MID$
GET$	RIGHT$
KEY$	UPC$
LEFT$	VAL
LEN	

Sound commands:
BEEP

Graphics commands:

DRAW	PLOT
INK	PRINT @
MOVE	WINDOW
PAPER	

Cassette commands:
APPEND
LOAD
SAVE
VERIFY

Printer commands:
LINK ON/OFF
LLIST
LPRINT

Monitor commands:
Command Operation
A arithmetic
B breakpoint
C copy
D dump to cassette
E execute
F fill
G go
H hex dump
I intelligent copy
J jump to Basic
L locate
M modify
O output to port
P increment program counter
Q query port
R read from cassette
T type into memory
U update register
V verify
W word find
X display contents of registers
Z display stored registers

Well connected:
The Lynx has an impressive array of input and output connections:
UHF TV (PAL colour)
RGB + sync (colour monitor)
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Power input

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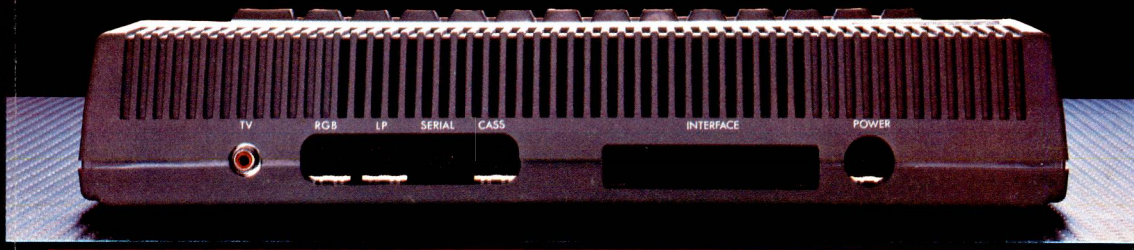


LEVEL 1 LYNX 48K MICROCOMPUTER £225 RRP

Designed to Grow

The array of connections that lies behind a 48K Lynx looks a little sophisticated for a £225 machine – and with reason. Camputers realised from the outset that many people were looking for an affordable home micro that was *planned* to grow, by stages, to meet their rising expectations. You can start with a 48K Lynx and extend it into a full professional personal computer – because the Lynx is designed to be future-proof.

That's why you'll find connections for disk drives, printers, composite video and RGB monitors, for example. But you won't find a slot marked 'Memory Expansion'. Because the Lynx memory is designed to expand neatly and tidily, *inside*. As you'll see, inside this leaflet.

Professional Approach

The 48K Lynx makes a perfect introduction to computing because it's a real micro, not a toy. With a background in developing business systems, Camputers' engineers took no short cuts on the features that count.

Standard Pitch Typewriter Keyboard

It's easy to use, tough enough to take a beating from the most frenzied games player – and slick enough to satisfy professional keyboard users.

The standard 16K ROM and 48K RAM offer a healthy 13.75K of memory accessible to Basic in full high resolution colour.

A Picture of Precision

And the high-res display is unsurpassed in its class: 248 by 256 pixels, with every pixel individually addressable in eight colours.

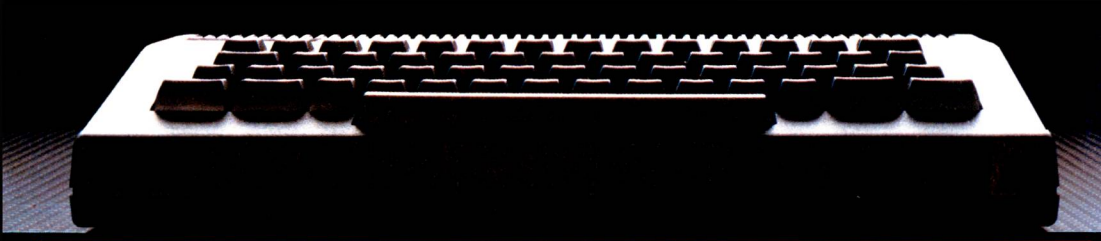
Sound comes from a 6-bit digital-to-analogue converter which allows sophisticated sound generation under software control.

Our Basic is far from basic

Lynx Basic was specially written to make the most of the Z80A microprocessor. It's unusually comprehensive and exceptionally fast. If you're a beginner, you'll find it easy to get to grips with – and the straightforward manual will take you step by step through the principles of Basic programming. More advanced users will appreciate the facilities for structured programming and the built-in machine code monitor. And through 'Lynx User' magazine, you'll be able to share tips and experiences with other Lynx owners.

That's just for Starters

With the 48K Lynx, all you need to start with is your own T.V. for display and a cassette recorder for program and data storage. But if you're looking for more, it's there by design. Read on . . .



LEVEL 2 LYNX 96K ADVANCED MICROCOMPUTER £299 RRP.

More Power, More Features

If you've already had experience of working with less sophisticated machines, you may well want to move straight to a 96K Lynx to take advantage of its remarkably competitive specification.

For 48K Lynx owners who are ready to take the next step, the 48K machine can be upgraded to full 96K specification for just £89.95.

Workspace for Ambitious Programs

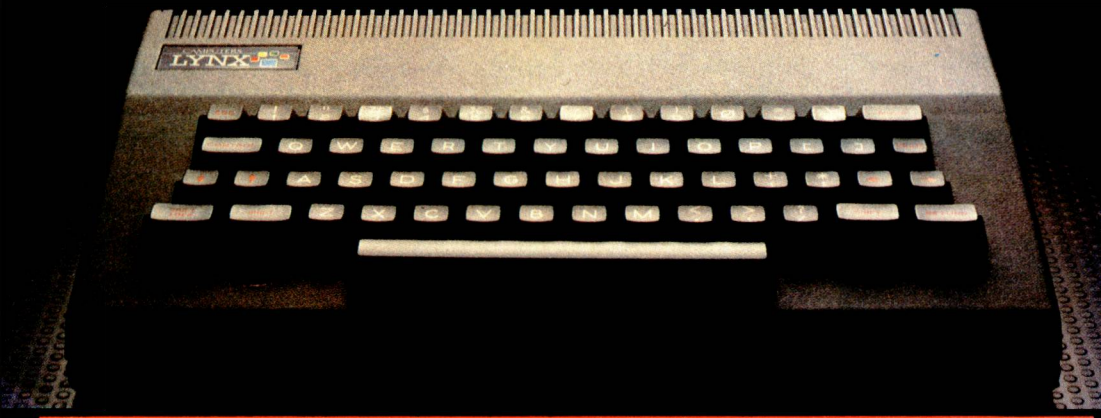
The most important feature of the 96K machine is its additional memory. With full high resolution colour, it provides 37.5K of RAM directly accessible in Basic – with up to 24K more available to programs using machine code.

Exercise your Rights

The extra memory of the 96K machine helps you make the most of the outstanding features it shares with the 48K Lynx: remarkably high resolution graphics and the highly-praised Lynx Basic with its built-in machine code monitor. Additional ROM features on the 96K Lynx include drivers for both parallel and serial printers, and a range of pre-formatted sound effects.

A Purposeful Processor

Like the 48K Lynx, the 96K is based on the CP/M* compatible Z80A microprocessor. So at heart it's a professional machine; if you want to step on up into the world of professional personal computing, you won't have to forgo your Lynx. Unless, of course, the kids won't let it go . . .



LEVEL 3 LYNX 128K PROFESSIONAL MICRO £445 RRP.

If you Really Mean Business . . .

Conceived for the serious business, scientific and educational user, the 128K Lynx is the top of Camputers' range for 1983. It's the fulfilment of the Lynx concept, eliminating the gap between keenly priced home machines and powerful but expensive business systems.

Business Standards

The key feature of the 128K Lynx is that it runs CP/M, opening the door to a wide range of the best-known business and professional programs. The RS232-type serial port facilitates communication with other peripherals and hardware; making it easier, for example, for your Lynx to work directly as a mainframe computer terminal.

LEVEL 3 LYNX 128K PROFESSIONAL MICRO £445 RRP.

Dazzling Graphics, Word Processing

The 128K's memory expansion includes a more powerful screen driver, doubling resolution to a pinsharp 248 by 512 pixels. Text display increases from 40 characters to 80 across the screen, allowing true word-processing comparable with dedicated machines. Like all Lynxes, the 128K gives you complete freedom to mix text and graphics, so you'll be able to produce really impressive plans, charts and graphs in full colour.

The Economic System

With Lynx disk drives and monitor added, the Lynx 128K makes a complete business and professional system. And because it's part of an integrated 'family' concept, the price is almost too good to be true. The only catch is, the family may insist you leave the first Lynx with them, and buy a new 128K for work.

The Lynx 128K will be available from Autumn 1983. Upgrades will be available from the same date.

PERIPHERAL EQUIPMENT AND SOFTWARE

Serial Printer Lead

The serial printer lead pack for all Lynx models includes free printer driver software on cassette for Lynx 48K owners. RRP is £3.99.

Parallel Printer Interface

Allows Lynx machines to be connected to parallel printers with standard Centronics interface. RRP is £49.95.

Joystick Interface

Allows connection of the widely-available Discwasher PointMaster joystick. RRP is £14.95.

Disk Drives

Lynx disk drives are single-sided, double-density, 40-track, 5¼" units with 250K storage unformatted. They can be used with 48K and 96K Lynxes under the Lynx Disk Operating System, and additionally with the 128K Lynx to run CP/M. Disk Drive 1 includes the operating system and controller; up to three add-on units can be used to increase disk storage capability. The recommended retail price for the Disk Drive 1 unit (including disk controller) is £343.85; the recommended retail price for add-on units is £228.85.

Software

Camsoft, Camputers' own software subsidiary, provides a growing range of home, games, educational and business software for the Lynx range on cassette. Software releases on disk and ROM are planned. For an up-to-date list of software available contact Camsoft at 33a, Bridge St., Cambridge.



Additional Languages

Add-on ROM cartridges in preparation for the Lynx range include Pascal, Forth, Logo and COMAL.

Assembler

The Lynx assembler on cassette and ROM cartridge is available at a recommended retail price of £29.95 for cassette and £39.95 for ROM cartridge.

*CP/M is the trademark of Digital Research Inc.

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Camputers' policy is to respond effectively to consumer demand; product specification and availability dates are effective at time of going to press but are subject to change.

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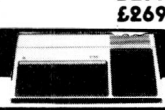

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Spectrum compatible printer



- ★ Obeys standard Spectrum commands.
- ★ Printing speed 120 lines per minute maximum.
- ★ Low cost paper supply.
- ★ Price includes power supply and interfacing.

This thermal printer, now available in the U.K., is the standard printer used with the American version of the ZX81. The printer plugs direct into the Spectrum but has a through port allowing the use of additional hardware through the same connector.

The size of the printer is 7¼ x 5¼ x 3½ ins. attractively packaged in a moulded matt black plastic case.

A separate power pack is supplied in a 2½ x 3½ x 2¼ ins. case.

Two switches mounted on the printer allow for on/off switching and also access to the test mode and paper advance commands.

The printing speed in the self test mode is 120 lines per minute.

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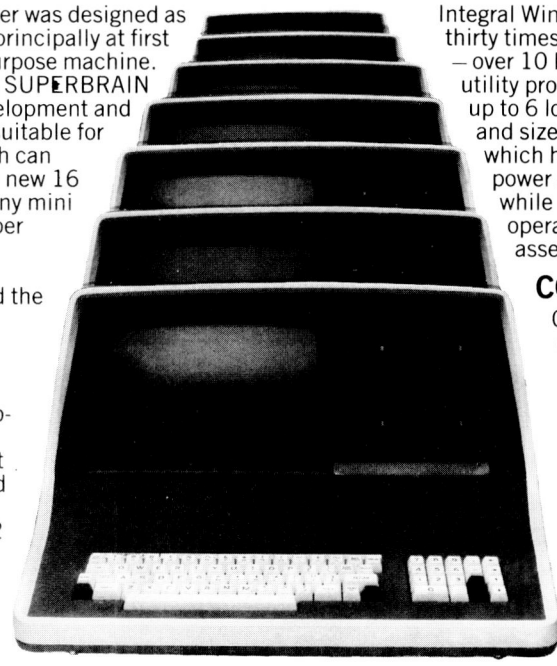

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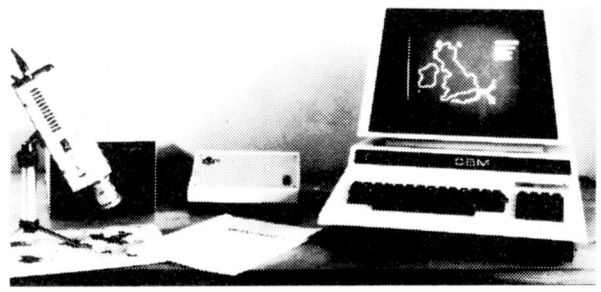

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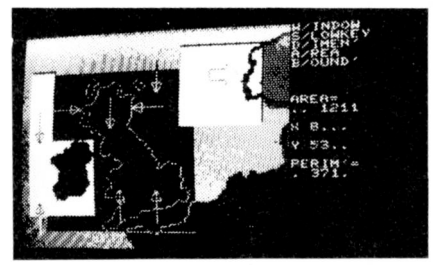

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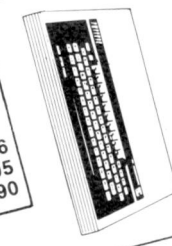

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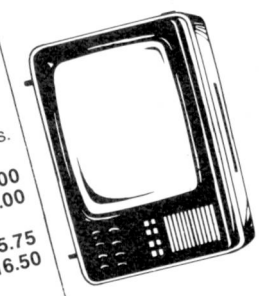

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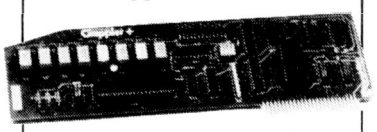

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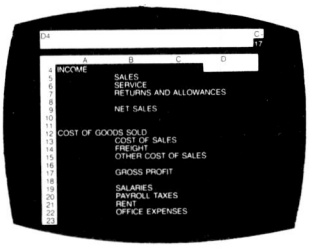

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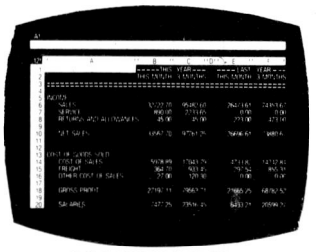

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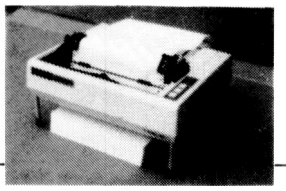

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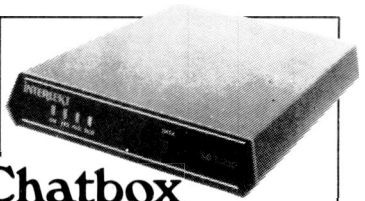

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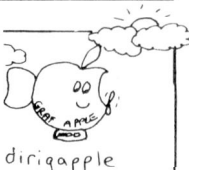

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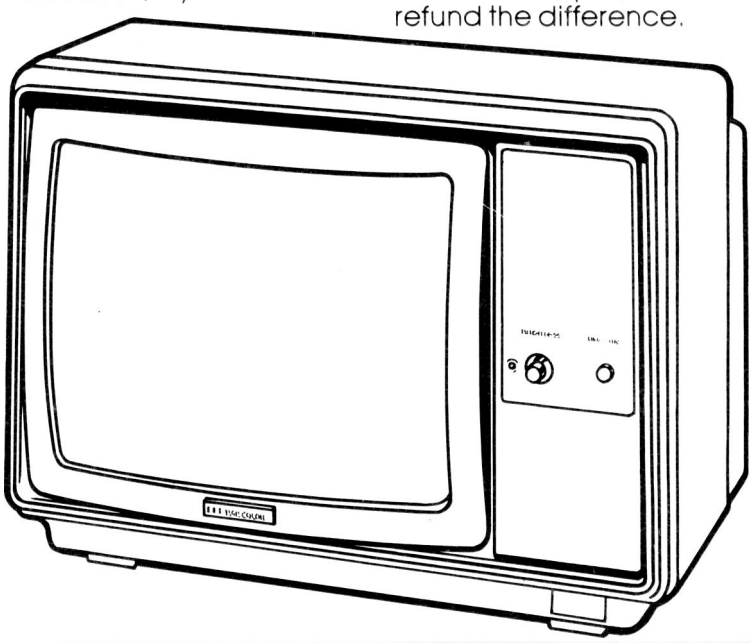

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On your guard

Sometimes, when prices of micros start falling, it doesn't mean a thing. It happens all the time. But at other times, it can indicate the approach of the end of one model or another.

Study the prices of cheap micros—like the VIC, the Atari 400 and the Texas 99/4A.

In the case of the Texas machine alone, it is possible that the price cuts do not indicate a fairly early retirement.

In America, the word is already out from Commodore to its biggest retail chains, saying that by the end of this month, the VIC-20 will only be made to special order, and that a special order will have to be a pretty big one (100,000 machines or so) to be considered.

You will probably have noticed that it can be very important for a supplier to warn its bigger distributors of a move like this—you will remember how, in April, Sinclair dealers were all caught on the hop when Smiths cut the price of the ZX81.

Because WH Smith was not properly prepared for the cut in the price of the Spectrum, it felt very unsafe with a rumoured 20,000 ZX81s in its warehouses. Smiths felt that the 16k Spectrum was too close to the price of a 16k 81, and if it didn't shift all its ZX81 stocks ahead of the time when Spectrum prices dropped, then nobody would want them.

But of course there are big drawbacks to giving lots of advance warning. And the major drawback is that customers seem very nervous about buying a computer that they think is about to be replaced.

Indeed, by the time you read this, you should be able to buy the Commodore 64 for under £200. Before the end of the year, you should be able to get it for something closer to £150.

At that price, the difference in power between the VIC-20 and the 64 is too much to warrant going for the slightly cheaper machine. But unless Commodore does reduce the 64 price to that level, it can't really compete with the new Ataris, or the Spectrum or the Texas Instruments micro—or sell in the sort of numbers that would replace the trade done in VIC-20s.

And unless it does sell in the same sort of bulk as the VIC-20, the market for software will not grow. And if the market for software doesn't grow, then nobody will want to buy the machine . . .

That, of course, is why Texas Instruments is continuing to make its 99/4A at the currently absurd price of £99. It isn't that Texas can make a profit on the sale. It is just that if it doesn't sell a whole lot more machines, it will never get its money back on all those plug-in cartridges.

In the case of the Atari 400 (and 800) the drop in price has already resulted in the end of the machine as far as American buyers are concerned. New machines have appeared, and the last of the old ones are being cleared out of the warehouses.

Britain will continue to see 400s and 800s for months to come, however, as there are no UK standard versions of the new 600, 1200 and 1400 range. But by the time of the Christmas rush, it is just possible that this will have changed—and one of the signs to watch for will be a sudden dive in price of the current range.

In the old days, this sort of information was a lot less widespread than it is today. The big manufacturers could let their big dealers know a good four to five months in advance. By the time the smaller dealers got wind of the move and leaked it to me, there would only be a matter of a month or two left.

These days *The Sunday Times* journalists may still not know the difference between read-and-write and read-only—but they can recognise a distribution deal when it hits them in the face. And they can print the story within a week—so the big manufacturers are reduced to telling lies.

You ring them up and you say: 'Is it true you're about to discontinue the ABC123?' and they say: 'No.' Then they discontinue it. Even worse, they plan to discontinue a micro, announce its end, stop making it—and then find that the general public still likes it, so they start making it again.

You're on your own.



This is a Spectrum: the box on the back says it is an RS232C interface, and that is what it is. It will let you connect your machine to a printer or to a modem or to another computer (up to eight other devices, in fact).

It costs £50, and here's the surprise: it comes from Israel. Details are obtainable, but you have to call Tel Aviv (03) 280453. The company responsible says it's looking for dealers, and I believe it. When it gets one, I'll mention it.

End of the rainbow

My mailbag, previously full of complaints from would-be DEC Rainbow owners that they couldn't get that machine, is now full of complaints by Rainbow buyers that they can't get diskettes. This is because DEC refuses to let people format blank ones.

To my delight, I note in the Consup (computer suppliers) catalogue that a box of pre-formatted Rainbow diskettes is available with a year-long guarantee.

Xitan, the Southampton store, tells me that there is available a special diskette formatting machine available from its store which will do the job very easily. It can also format Andromeda (from ITCS) CP/M diskettes, which ITCS said wasn't possible, and copy programs onto them, which ITCS said would never be possible. Oh, well.

Consup is behind Waterloo Station in London: tel 01-928 3252.

Amateur antics

It is very naughty of the old Amateur Computer Club (now the ACC) to publish a circuit for a single chip modem using the AMD AM 7910 integrated circuit. Some people get the idea that they can build a modem, connect it to their micros and to the telephone, and start sending messages to other users, and of course, British Telecom would never allow that. Oh, it'll probably work, OK, but most of us are so stupid that we'd probably connect the phone system to the mains.

The club notes that the chip (and data) is available from Hawke Electronics on 01-979 7799 with the exception of a

transformer, available from RS Components.

And it also notes that while this circuit doesn't do auto-answer, this 'could easily be added with some circuitry to detect the ring signal.'

Quite by coincidence, I have been told by Texas Instruments that an integrated circuit (chip) called the TCM1520A will detect the ring signal, and costs £1.40.

You join the ACC by writing to Rupert Steele, St John's College, Oxford OX1 3JP.



The rather elegant little box perched atop the BBC Computer in our picture contains what is described as 'the smallest possible disk system' for the BBC.

Produced by Advanced Memory Systems, the unit contains the new Hitachi 3in drives, and the system comes complete with cables, manuals, utilities on disk and in EPROM, and a set of free disks. The drives are encased in rigid steel and will cost £225 for the single and £399 for the dual version.

The disks are totally encased in rigid plastic and feature a switchable mechanical tab to prevent overwriting. Each side of the disk may be used—it is simply flipped over in the same way as a music cassette—and each side holds 100k. More details from Advanced Memory Systems on (0925) 62682.

Torchlight procession

There is about as much similarity between the Torch and the Tiger as there is between a Cortina and a Cavalier motor car. After the initial letter, nothing is the same.

So the computer world has been a wee bit baffled by angry noises emerging from Torch, virtually accusing Tiger's builder HH Computers, of stealing the design.

Speaking from somewhere off his trolley, Torch boss Martin Vlieland-Boddy suggested that 'about fifteen months ago, HH came to us with the request that it wanted to manufacture the Torch, and we let the engineers come in and be privy to the design of the Torch, such as the colour graphics, the dual processor, and the modem.'

True, the Tiger has two (perhaps even three) processors, and so does the Torch. But the idea of colour graphics goes back to the Apple II (scarcely the best-kept secret of the micro business) and integral modems are at least two a penny these days. Further, the two processors in the Torch are entirely different processors from those in the Tiger.

According to HH boss Mike Harrison, the idea is even sillier than it seems.

Apart from the small fact that Torch didn't design its own colour graphics, but uses the BBC Micro to do them, Harrison assures me that the Tiger was completely designed 'by an outside consultant' by January 1982.

That outside consultant was Tangerine, not anybody connected with Torch or Acorn. 'Torch in fact approached us,' said Harrison, 'because it wanted to have us build its system. We had had a factory, together with an enormous amount of freehold land, with some six years of experience, whereas Torch was a startup, with no factory.'

That was in April, four months after the Tiger was completed, said Harrison. And apart from showing some general design ideas, Torch gave 'no detailed technical specifications'.

When I last spoke to Harrison he was thinking of taking out some injunction against Torch 'to stop it making these unfounded allegations'.

I reckon he can save himself the bother. I don't know anybody who understands them, never mind believes them.

Maggie Burton adds: HH has put a request through its solicitors that Torch retract its statements, though HH's sales director John Kerr explains: 'We didn't want to respond.' When asked if he felt the whole affair was a storm in a teacup, Vlieland-Boddy replied 'Oh yes—at the end of the day it'll all go quiet.'

Indeed, HH Microcomputers did not design the Tiger itself. It purchased the design from Tangerine in 1982. The Tiger was actually designed before the Torch and before HH had any access to Torch's secret documents. Besides which, the two machines have different processors (the Torch's BBC board contains a 6502 and the Tiger's second processor is a 6809) although both are Z80 based. The Tiger runs CP/M and the Torch runs a compatible operating system of its own—the ROM based CPN (control program nucleus).

In fact the two computers are simply the same type of machine. But it is worth noting that the Tiger comes with software like TigerMail, and TigerTel—similar names to TorchMail and TorchTel, but not exactly an infringement of copyright. 'There seems to be an intent' is Vlieland-Boddy's way of putting it.

Zorba's dance

Minicomputer builder Modcomp is going into the Osborne business. It has just bought Telcon, which designed and built a machine called Zorba.

The machine is one of the more impressive improvements on the concept of the 'computer-under-the-airline-seat' which Osborne pioneered.

It has very much bigger disks, a nicer display, a useful batch of software, and can read diskettes produced by other machines.

'We wanted to distribute the micro,' said Modcomp general manager, Mike Rogers, 'and it was like that electric shaver advert—we liked the product so much, we ended up buying the company.'

Rogers plans to manufacture the portable in Ireland, where Modcomp already has some factory facilities.

Possibly, he said when announcing the deal at the National Computer Conference in Anaheim (California), there would be some manufacture in England, too.

He'd better move fast. At £1600 for a nice enough CP/M machine he has to face two unpleasant facts: first, the Osborne 1 will mostly be discounted to under £1000 inside a month or so; and second, the portable market is about to be hit hard by imitation IBM micros like the Hyperion (see below), the Corona, the Compaq, and several others waiting in the wings.

And as one (typical) dealer said: 'No, I won't be stocking it, because people will come in and ask: 'How does it compare with the Osborne'—whereas if I show them the Osborne, they never say: 'How does it compare with the Zorba' or whatever.'

Optical illusion

As of the end of this year, disk storage is in terrible trouble. That is when Shugart expects to start demonstrating laser-based optical disks.

The price of the machine which Shugart-owned Optimem will release is $5000 or so. That is obviously a bit above the budget level of the

average Spectrum or VIC-owner, but not as far above as you might think.

The catch is: for that $5000, you get 1.5 gigabytes of storage. (A gigabyte is a thousand megabytes.)

Take a moment with pencil and paper to work out what that means.

A floppy disk with 100 kbytes costs around £200. A hard disk with 100 times as much storage (ten megabytes) would cost only ten times as much (or less) at £2000. But although the cost per byte is one tenth, the drawback is that you can't take one 'hard' disk platter out and put another one in—or at least, not yet.

To offer the same cost per byte as a hard disk, the floppy drive would have to cost £20. That's not totally out of the question—floppies under £100 are only months away, and under £50, less than two years away.

But for the hard disk to offer the same cost per byte as the optical disk, it would have to come down from £2000 to £30. And the floppy would have to cost 30p.

In addition, the optical disk can be taken out of the drive and replaced—giving another 1,500,000,000 characters of storage—for around £50 or less.

Finally, the optical disk can be used as a coffee cup mat; you can leave magnetic executive toys on it, and it doesn't suffer a 'head crash' if you bump it while it's running.

Moral: don't be in too much of a hurry to buy disks. Very shortly, the guy selling them will be in much more of a hurry than you would believe, to get rid of them.

Unexpurgated version

Micromodeller is used to model corporate finances, in a vaguely similar way to VisiCalc. It is a program which is now the subject of some of the most confusing distribution arguments since Onyx.

Originally, the program was developed by American software company Ferox (named after the nickname of its founder, who is known as Rusty) which sold UK rights (exclusively) to Intelligence UK.

Then the trouble started, and you have to start listening to different versions of different stories.

Intelligence claims to have re-written large parts of it, and made it an entirely different product, which the company hopes to sell into the US again.

According to Ferox, however, the product has been superseded by Ferox Modeler which Intelligence has only marginal rights to sell under a deal which was renegotiated at Intelligence's own insistence.

Off the record and behind backs, you can hear even more exciting allegations, all unprintable, about royalty escape clauses, unethical business practices, and other double-dealing.

About the only thing I know for sure is that David Low has now left Intelligence and has set up Ferox in the UK, selling the Ferox version, and that Ashley Ward at Intelligence isn't pleased, any more than is Ferox International boss Richard Hykes.

Any unbiased observer who has compared the two (or is it three?) versions of the program, please feel free to drop me a line with your comments.

Jupiter plays its ace

At the recent Computer Fair in Earls Court, one computer company, Jupiter, could be seen shedding its old grotty image by driving a series of robots.

This is the first step in a whole new deal for Jupiter Ace computers, starting with the launch of a new, prettier box to replace the floppy plastic one of early models.

New face Geoffrey Walker, a man with widely varied business experience (about which he is strangely shy, considering that the worst thing he seems to have done was to work for his father's company for a while) is bringing management to a formerly amateur group.

Some 5,000 machines have been bought, bringing the language Forth (without disks, of course) to many beginners, instead of Basic.

The news is good for existing users, too. The main reason for the new professionalism is the fact that Jupiter is hoping to start selling to Americans, and is beefing up the machine's specifications with reductions in radio interference, new add-ons, and a serious scientific range of software.

The work done with Cyber Robotics is just one example: and of course the result (if it all works out) will be a sudden surge of software for the otherwise minority-interest computer.

The new model, costing maybe £10 extra, will appear in the next couple of months in stores.

Ripe Apricots

From the sound of sniggering and the clash of cutlery, it seems certain that I'm going to be made to eat my words about ACT's Apricot, which is due to appear a matter of days after I write. Last month, I suggested that the machine couldn't possibly be ready this summer if there were only prototypes available in April.

According to my sources, however, the machine is not only very nearly ready, but also very nice. I hear of things like portability, like IBM compatibility, like very high resolution graphics, like a special display for the programmable function keys, and all in all, I'm no longer surprised that it is going to be available sooner than I thought.

It is obviously, very obviously, too clever to be an in-house design; and I look forward to hearing which bright boffins produced it instead of sweating over military-specification ULAs or missile guidance systems for one of the power-mongering electronics firms that decorate so many Whitehall committees.

Outpaced

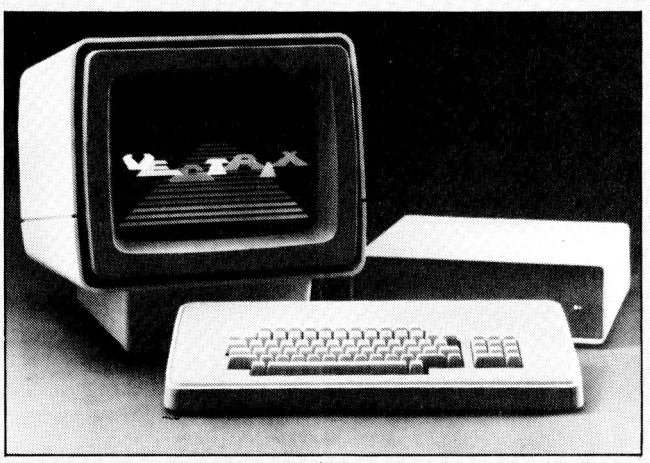
The non-availability of Acorn's disk filing software (DFS) is a matter of legend: presumably the legend will now grow to encompass a long list of rival products which do the same thing as DFS would do, but are actually available. Some of them actually will be.

Pace Software Supplies has stuck its neck out and announced such a product 'measurably superior to that of Acorn', consisting of 11 chips and some permanent memory.

I hope to see it soon: in the meantime you can investigate yourself by ringing them in Bradford on (0274) 575973.

Lost identity

Nicest of the imitation IBM micros is the portable Canadian design, the Hyperion. It isn't the closest to the original, because it has several improvements such as an area of memory which acts like a very, very fast diskette, much nicer disks, and a very nice



The nice US built graphic work station (terminal) which this column mentioned last November—the Vectrix—has now arrived in the UK, courtesy of Sintrom.

The thing does colour graphics in a lot of detail, and is less than £2000. Sintrom says that this is 'the first time such facilities are available to the PC user for less than £2000,' from which we learn that Sintrom has not heard of the Pluto, made by I/O Research at roughly half the price (or less) and superior in a lot of ways. And, incidentally, built in the UK.

Details on Reading (0734) 87564.

display.

At £3000 it includes a very nice set of integrated software, and obviously is capable of giving IBM a run for its money.

What isn't immediately obvious about it, however, is the identity of its maker.

It first appeared at the Comdex show last November as the Hyperion, built by Bytec Dynalogic in Canada. Then it showed up in Britain as the Anderson Jacobson Ajile. Then Gulfstream launched it in the UK, and promptly announced that Gulfstream was now actually a Bytec Dynalogic subsidiary. And then it appeared on the SCI stand at the NCC under the title 500.

George McFarlane, boss of Bytec in the UK, explained the deal, and made it sound nice and simple.

'We build it at Bytec, and SCI in California is now going to start building it as an alternative factory source,' he said.

Anderson Jacobson, says McFarlane 'is not entitled to pose merely as a distributor. If it wants to sell the Ajile, it must redesign it — a new colour box, and extra hardware and software. It must clearly be a different machine with no possibility of confusion when someone comes to service it.'

The fact that all the Ajile models so far seen look exactly like Hyperions is easily explained: they are Hyperions.

'We let it have 60 to show to its own distributors,' said McFarlane. 'But the deal is that it must let us have its specifications, and we will build machines to those specifications. We expect them to offer a 1200 bits per second modem and special software, for example.'

So far, this specification is not finalised. 'And it will take at least three months, I would say, before we can build the machine once we get the specifications,' said McFarlane. 'Until then, we aren't going to give AJ any more machines.'

Seeded

While we wait for Dragon to produce a disk operating system, Seed (specialising in equipment using Motorola processors) has released a single-board system based on the same 6809 chip.

This already has the OS/9 operating system which Dragon has been negotiating for at least six months, so although it looks more expensive than the self-contained Dragon, it is more expandable at present. To use the drives, however, you will need an extra disk controller, and, of course, the disks.

Seed also promises to offer a big 16-bit board (based on the 68000 chip, star of the Apple Lisa) 'soon' — but no date, no price.

Details on Brownhills (05433) 78151.

Transatlantic Dragon

Plans to put disks on Dragon computers are at last starting to reach the point where they stop being just plans, and start being disks.

American firm Tano Corporation is planning to order 10,000 machines for launch in that country, with a September date set for US manufacture.

By March 84, says Tano's boss Benjamin Albert, there will be a double memory version (with 128 kbytes storage) with a disk operating system called 09/9.

Quite how firm this will be is open to some question: Tano expects to sell the machines at $400, in competition with the Commodore 64 (now costing well under $300 there). Current Commodore plans, however, could put the 64 a lot lower by March next year, since the company is planning a $300 machine with the 16-bit Zilog Z8000 chip in it for January (launch, not availability).

But the operating software is the first essential, and now that that is on the horizon, officially, things can move towards disks. There wasn't much point before.

Virgin soil

Virgin Records is now selling computer games — see 'Screenplay' in this issue. It has started off tastefully enough with a game based on the Falklands events of last year, called 'Yomp' and has impressed its competitors with only one thing — the number of stores that carry the games.

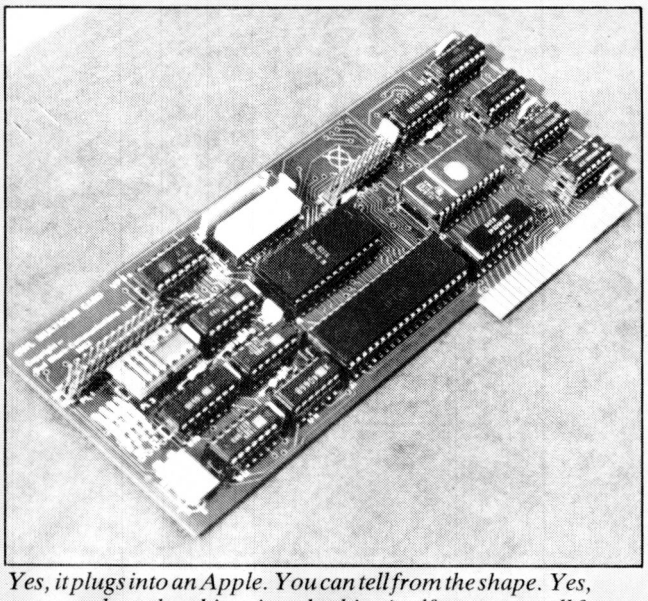
According to Nick Alexander, head of Virgin Games, people are sending in programs by the hundred.

According to his competitors, it looks like it.

So far there are four Sinclair Spectrum games (Yomp, Sheep Walk(!), Star Fire and Golf), three BBC games (Bug Bomb, Land Fall and Space Adventure) with a VIC 20 game called Mission Mercury to make up the number.

Each costs £8, and will be sold through computer stores, plus as many record shops as Virgin can persuade to take the tapes. That includes 200 Virgin stores, for a start, and Alexander says he will be circulating the titles in the Virgin catalogue to the 5,000 or so record stores on the CBS list.

So you could see a lot of them.



Yes, it plugs into an Apple. You can tell from the shape. Yes, you can plug other things into the thing itself — you can tell from the spikes.

The things you can plug into it include serial and parallel devices — printers, modems, computers and the like. The unusual thing is that you can connect both, together, with this one card.

Details from Owl Micro Communications on (0279) 723848.

ACT franchise

ACT is now planning to set up its own shops. From an ACT shop, you should be able to buy the sort of things that you can buy in any business-computing store, with the obvious extra point that you should be able to buy the entire ACT and Pulsar software range.

The chain of ACT shops will be called Computerworld if the group gets its way, but there are obstacles to the name. There is a company which is called Computer World Trade, which admittedly didn't jump into my mind when I heard Computerworld, but which might nonetheless get edgy. And there is a newspaper called *Computer World*. Normally, there is nothing to stop a shop having the same name as a newspaper, but again, it leaves the edge of uncertainty lying about to trip over.

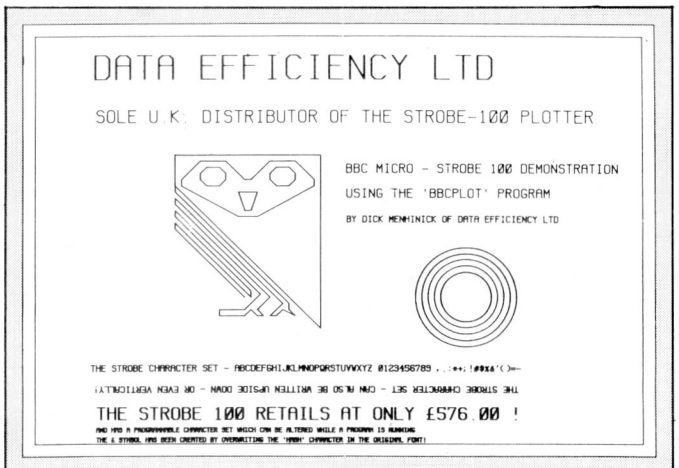
Interestingly, the idea is not for ACT to own the Computerworld stores. The pilot store has been set up with a minority ACT ownership, in Bristol — but the company executives assure me that this is an exception.

Instead, the stores will be franchised, like McDonald burgers. ACT will provide the décor, to ensure they all look alike, and can share in the benefit of group advertising, but the store manager will have his own business.

And despite what you may think, people selling the ACT Sirius *will* be able to sell other micros — 'even the IBM PC if they can convince us they need the franchise,' said an executive. 'But obviously we will generally take the line that we have such a wide range of products that they shouldn't need to.'

Talking book

Very much approved by Commodore is a 'Talking Book', established to use a



For schools, a half price plotter (£360 instead of £606) plugged into a BBC Micro is the sort of deal that makes the difference between buying a plotter or not.

Data Efficiency, therefore, has come up with a very clever deal by offering the Strobe 100 plotter at that price. The money also buys some software called BBC Plot (on cassette tape or on 40 track diskette) plus the cable to connect them.

The above picture of the BBC Owl was done using the combination.

Details on (0442) 63561.

voice chip launched last month.

The book is the first product of a group of educational consultants, who call themselves Edata.

The Talking Book, they say, is great for teaching reading—especially to adults or adult dyslexics.

According to Jim Abraham, head of the consultants (and also head teacher of Arthur Dye Primary School in Cheltenham), it isn't a question of whether a teacher could do the job better.

'In fact, the computer is very good at the job,' he said, 'but the point is that teaching reading normally takes one teacher to one pupil. The pupil gets stuck on a word, and asks the teacher for help. This is terribly costly, needing one teacher for each pupil, or else leaving most pupils without a teacher.'

'And anyway the computer has its advantages,' he says. It can pronounce any word in the book, 'and it is emotionally neutral, and infinitely patient. Both are particularly important with adult reading students.'

Future strategy

Future Computers is still one of the most aggressive looking British efforts getting into the IBM type micro market: it has, however, plumped very firmly for CP/M-86 as its native operating system.

There are two reasons for this: first, CP/M is currently the only multi-tasking system (it can attend to your word processing, remote modem operation, database search and program compilation all at the same time) for single users.

Future has an integrated local area network, and wants this to be able to run the network while the user gets on with other things.

Second, the machine will (when it is available) not just look similar to the IBM machine, but will actually emulate every little quirk of PC-DOS. So there is no need for MS-DOS, is there?

And of course since Brian Jackson is such a good customer of Digital Research, he will know full well that Concurrent CP/M-86 will also emulate MS-DOS by the end of this year (or at least, that's the plan).

After care

Eyebrows will rise at the idea of paying an after-sales maintenance fee for a programming language—but Bristol-based TDI, distributor of the Sage (it uses the Pascal language), hopes to persuade people it's a good idea.

The move is one of the first in the micro business which acknowledges that software is never perfect, and that sooner or later someone will want to do something that is in the manual, but just won't happen.

'Most software has some sort of guarantee, but it's rarely worth the paper it's not written on,' quipped TDI technical chief Roger Howarth, announcing the move. 'We're offering a maintenance contract on the p-system (the operating system and interpreter that turns Pascal p-code into a working program) in the same way we offer one on the Sage.'

For the first three months of using the p-system, customers can get free help from Support Services hotline. After that, the customer is cast free, unless he opts for the £50 fee for the rest of the year, and after that, the support costs £100 a year.

The idea is a good one, and I hope it catches on.

Possibly there will be some problems. You may recall that the old Post Office was forever preaching at people who had perfectly good phone directories, but still dialled Directory Enquiries for local numbers—and I suspect many users will evolve similar bad habits about their systems manual unless TDI works out a way of monitoring 'silly' requests for help, and allocating a premium fee for grockles.

Expensive aid

There are a lot of big, expensive, powerful micros which can run Unix, or Pick—both operating systems of sufficient complexity to make CP/M look like a toy (friendly, easy and fun to use).

To assist people stuck with Unix or Pick systems, a program writer called The Programmer Systems (TPS) was developed by a software group called The Software Group (!) in Denver, Colorado. It seems like a nice product—but at £6,000, I suppose it has to be.

This month's news, anyway: TPS is now imported by Fletcher Computer Services, in an effort to make expensive systems like Adds Mentor, Honeywell Ultimate, GA Zebra, IBM Series 1, Altos 586 and CMC Reality look even more expensive to buy.

Details on 01-493 7535—the publicity agency.

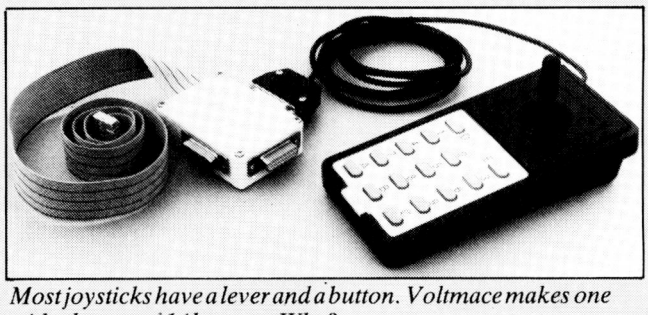
Short circuit

The company which produced the first portable computer, Osborne Computer Corporation, has barely scraped through the worst crisis of its short history, having been saved from what accountants call 'bad cash flow problems' by an injection of around $20 million.

How the company actually got to the point where all the shareholders (or all I know about) had to cut their share of the stock by half is one of the saddest tales of wasted optimism ever.

The reason Osborne got into cash flow problems was simple enough: the company couldn't ship enough machines to pay the previous month's bills.

And there were two occasions when this happened: first, when it was switching to



Most joysticks have a lever and a button. Voltmace makes one with a lever and 14 buttons. Why?

'With games becoming more complex, one fire button is not enough, and there are now numerous games around which use several keys on the keyboard, even if it is under joystick control,' says Voltmace.

The 'handset' as it is called, costs £11, and an adaptor box (plus cable to go with it) costs £14.

As to how many games will use this thing, only time will tell: 'We are currently contacting writers of BBC software in the hope that they will provide an option in future games that will allow full use of our systems,' it says, 'and possibly retrospectively, routines that can be run to transfer existing software to the handset.'

Details on Baldock (0462) 894410.



The colour printer which visitors to the Apple Show in Slough saw is a Seikosha model, costing £425 retail.

This is a lot cheaper than even the cheapest colour printers have been up till now, and since Seikosha is known for making a cheaper-than-usual but incredibly noisy black-ink printer, you might be forgiven for supposing that this was another rather crude device.

In fact, this Seikosha is a noticeable step forward in technology. Normally, colour printers have a three (or more) colour ribbon, and have to print each line three (or more) times, moving the ribbon each time.

This one, apparently, has four print hammers and can print any combination of colours in a single pass of the print head.

According to DRG Business Machines, enquiries have been very enthusiastic. I'm not surprised: just don't task me how to interface it to WordStar.

Details from the publicity agents on 01-622 3434.

the new double-density disk storage system (storing 180 kbytes per diskette, rather than 90 kbytes) and second, when it was due to start shipping the new Executive, and didn't have any to despatch.

On its own, that wouldn't have been a near-fatal problem. The reason it was nearly catastrophic lay, paradoxically, in the success of the company. Growing at an enormous rate, Osborne needed absolutely every penny it could make in January in order to buy the parts for the February shipments.

Originally, the optimism was quite possibly justified. Osborne's dream was to produce a cheap machine which would provide a software standard. It would be the most common CP/M computer, and therefore most people would want to write programs for that one first.

To make it cheap, he said, he would have it designed in-house, but all the other work would be bought in from the high-powered specialist companies working in Silicon Valley. His nails-for-breakfast buyer, Tom Davidson, would bully incredibly low prices out of chip and board suppliers, and sub-contractors would assemble the boxes. And as soon as anybody tried to compete, the lean and hungry corporation would demonstrate that there was a lot of price elasticity in the design.

It went wrong almost from the day the first machines were shipped, when regular, ordinary people started joining the company. They wanted regular, proper jobs.

First of all, they weren't happy about the quality of the product. It was cheap and cheerful, and they wanted to be associated with high quality.

Then, when these bright new people inside the company found out that Davidson didn't seem to be on their side, they were appalled. Stories circulated of 'hidden commission' payments by successful supply tenderers, of designs sold to competing companies (Access Data) and of other double-dealing: whatever the truth, Davidson got fired.

And whether or not he was whiter than white, his ability to buy memory chips, plugs, power supplies and design expertise at half the normal price was not replaced. So the Osborne 1, far from being a very profitable item, became a very marginal item.

That wasn't too bad because Osborne's idea had always been to make his big money on software. One of his cleverest ideas was to get a list of every owner's name and address. He did this by withholding the dealer discount until he got the name and address. Then he mailed them (the owners) with offers of software.

But the idea of making money on software relied heavily on having a lot of software to sell. And it took much longer than people realised for this to happen. The machine was far from a standard CP/M machine, so software either had to be written directly for it, or had to be adapted. And the limitation of having only 90 kbytes of diskette space turned out to be another handicap to programmers trying to fit things into the system — too many of them had got used to at least twice that.

Double-density ran into problems, because the diskettes were simply not up to the standard needed. They went out, they came back. Deliveries stopped. Debts mounted, money didn't come in. Kaypro sold a lot into the vacuum, and made good publicity out of it.

Around this time, the power struggle (inevitable at the top of most big corporations) got to be vicious. Energy that should have been diverted to getting the product out, to getting a Mk II ready, to getting Mk III started, went into getting the boss fired — well, made into Chairman of the Board.

It also went into a meaningless dream — that of going public. Going public in America is the sort of thing that can take two very senior executives out of the firm, full-time, for as much as a year. And in the end, it was all for nothing, because Osborne Computer just wasn't in any sort of shape to go public.

The big capital injection now allows Osborne to pay its debts, and move on. So far, so good: but there are a lot of questions still worrying people in California, such as: 'Can the Executive sell in big numbers, soon?' and 'What will happen to the Osborne 1 ?' and 'How much will it cost to develop new, 16-bit products?'

One big white hope for the company, a smaller, tidier version of the Osborne 1 (it was first dubbed the Vixen, later the Companion) has been swamped by a wave of far cleverer and neater developments like the Gavilan and the Tandy 100. It has been cancelled. But it cost a lot of money to take to prototype level.

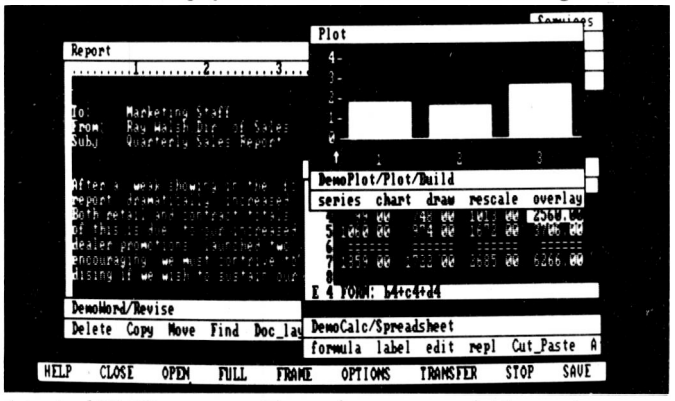
Adam Osborne and Clive Sinclair like to muse on the striking similarities in their fates. Both English, both ex-journalists, both regarded as figures of authority, both wise to the power of low-cost micros, and both making a fortune out of computers. Adam should have taken it a step further and reminded himself of another line in Sir Clive's pedigree. That is — 'made a pretty thorough mess of his first high technology company.'

Don't make the mistake of writing Osborne himself off. I don't know more than a couple of people in Silicon Valley who doubt that Adam Osborne now knows, in detail, almost everything he thought he knew before launching Osborne Computer.

He may even get knighted, one day.

Fighting fit

Gary Kildall could have been more explicit. He said that 'if IBM had not given the contract for its operating system, PC-DOS, to Microsoft, we would not be as strong as we are



A typical VisiOn screen with word processor, plotting and spreadsheet windows – see 'Fighting fit' story.

today.'

The battle continues happily between Kildall's Digital Research and Bill Gates' Microsoft, with all the fun of a long-running Dynasty saga—and all the predictability, too.

One month, Gates is trotting out his old friend Chuck Peddle to say that Sirius will now support only MS-DOS—but there is no war. Then the next, Kildall is offering Future Technology, Future Computer, and even PC-DOS itself, as proof that his company may not have IBM, but it has everything else. But there is no war, of course.

The wise pundit will keep an open mind about this race, as on any other unpredictable subject. But I have no pretensions to wisdom, so here's my opinion: Kildall is right, but he could express himself more forcefully.

What he should have said is that until it lost the chance to make CP/M-86 the IBM standard, his company was horribly complacent—but that now it is at least doing its job.

This month's signs are that DRI is working hard start off so that anybody with an IBM micro can buy Digital Research programming languages (CBasic, MT Pascal, and so on) without buying CP/M-86.

Kildall managed to make this sound like an important concession to the average user, and in terms of appearances, psychologically it is. As for his suggestion that support for languages under PC-DOS was not the same as support under MS-DOS, there are many who will take it as acknowledgement of defeat.

For the average user of IBM type machines, however, it is more significant that you can now buy Concurrent CP/M86 to run on the hard-disk version, saving as much as £840 from the price if you buy applications to run with it.

That version of CP/M is very nice, spoiled only by the delay in getting the modern file-handling abilities of CP/M Plus. And by selling it with applications that use CP/M, he will start pushing the statistics the other way.

For the future, the most significant move is probably the decision to support Visicorp in its VisiOn venture.

VisiOn (says Visicorp) will do for IBM users what the mouse does for Apple Lisa. Having CP/M in the package, even if DRI itself comes up with something rather similar (like the Monarch system which Commodore's Tramiel keeps talking about) makes CP/M look like a much longer-term thing.

Colourful edition

WordStar has now joined the ranks of 'those word processing programs which are better than WordStar' by adding colour.

The latest version, numbered 'version 3.30', has been very considerably overhauled—particularly from the point of view of people using 16-bit micros. Previously, the bad features of WordStar became even worse on the more powerful machines.

But now, for example, anybody looking at page one and wanting to see page two can see it instantly (not three seconds later)—because memory-mapped display techniques are used.

Memory mapped display is not the same as 'bit-mapped' display, by the way. Bit-mapped means that you use high resolution graphics to 'draw' the characters, and displaying a page of bit-mapped text can take several seconds. Watch a Lynx, or a Concept, to see this happen at the cheap and the expensive end of the market.

Memory-mapped display is very different. The 'character generator' that turns codes in the memory (codes for these words, for instance) into blips on a TV screen, works very simply by starting at a particular memory pigeon-hole, and working its way (very, very fast) to the end of the screen, then starting again. To change this, all you do is point the character generator to a different part of memory. Alternatively (quite a lot slower) you read a whole lot of new codes into the memory map where the character generator is looking. Both these are much faster than going through the incredibly slow performance of pretending to send the characters, one by one, to a remote terminal.

For £50, previous users of WordStar can get the new software. For the rest, it is closer to £500, reduced to £414 until the end of this month on a special offer which also includes MailMerge, SpellStar, and StarIndex (total value £708).

There is a special plus for people with an IBM personal computer. Everybody can buy WordStar 3.30, but IBM PC users can use it in colour. On the screen.

McNulty's return

People who offer you a modem to connect your phone to your Sinclair Spectrum computer and who ask more than £50 are people who obviously haven't heard that John McNulty is back in business.

Actually, he will sell you a modem for any computer, but the Spectrum was the first.

McNulty has always been famous: he used to be rich, and he aims to be rich again. He will sell a Spectrum for well under £200 including a modem, a printer interface, software to drive them, and membership of the Professional Club, where modem owners can get together to swap data over the phone lines.

For other computer owners, he hopes to attract attention with a £100 modem that will transmit and receive, originate or answer at any combination of 300 or 1200 baud. Plug that straight into the phone—no need for acoustic coupling.

These days he calls himself McNulty's Interchange, and you can contact him direct on (0923) 52020.

Ask for a catalogue sheet—he does other clever things, too.

Age of Aquarius

First big-scale launch of the exciting new Aquarius micro from Mattel will be through W H Smith.

The retail chain started out in a small way with Sinclair micros, and has obviously enjoyed life in high technology a lot. It is now opening special 'Computer Shops'—the first three being in Birmingham, Croydon and Northampton big stores.

The Aquarius price was still not fixed at press time, but the chain will also sell Oric, BBC, Apple IIe, Commodore 64 and, of course, Sinclair micros.

This is in addition to the 248 Computer Know-How departments in existing Smiths branches.

Top ten

You probably think that the idea of a Top Ten in hardware sales and software sales is great. I am here to warn you that it could be very, very bad for us all.

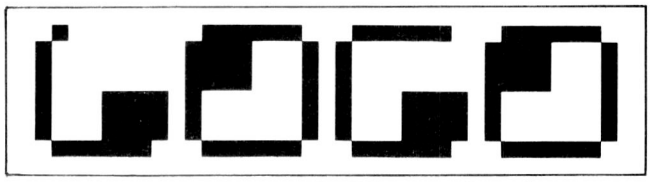
First of all, the published figures are hogwash.

In June, for instance, the top selling machine was the Osborne. Or rather, the Osborne was the tenth best seller, way behind the Commodore 8096, which in turn outsold the 8032 by miles and miles. The Dragon outsold everybody, except the Apple, or alternatively didn't appear in the listings. In that it was in good company: the IBM micro didn't appear either—or, to put it another way, was top seller.

It all depends on which listing you read. My own habit is to read them, but only for laughs. Whatever you do, don't base a buying decision on any.

The reason they are hogwash is complex.

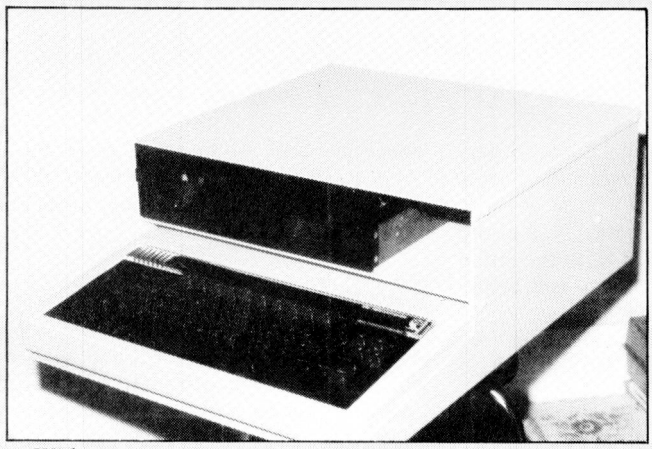
First, nobody actually knows



A new programming language for IBM users: Logo has licensed itself as the official educational language. This announcement is behind the announcement of (and will probably arrive behind the expected arrival of) Digital Research's DR Logo on the machine.

I'll be very surprised if there are big differences: apart from the fact that this will be the official one licensed by Logo Computer Systems Inc of Quebec to IBM directly.

And of course it has the incredibly creative Logo logo shown here.



Without your noticing it, the BBC Micro has grown stronger. It has a new case which (unlike the old) will actually hold the weight of a television set or monitor screen.

For those of us with the old flexible cases, Silent Computers offers this box, in fairly grotty metal admittedly but strong enough to hold the telly, and big enough to hold a couple of disks if they are small enough.

Details on 01-801 3014.

what a 'typical' computer store is, nor does anybody else know how many there are.

Second, market researchers persist in the belief that one day, with luck, they will suddenly understand what market segments are. They will be able to write down something like '400 IBM micros sold' and then look up their lists to see how many of these would typically go to hobbyists, how many to wheelchair makers, and how many to schools.

You can try to explain the futility of analysing the micro market like this until you get a head crash—they simply won't believe that Sinclair ZX81s sell to business users. They do, but the researchers are better informed than us, and know better, and so they leave out W H Smith.

That's the other reason. The researchers have their own theories about mail order sales. From the complaints and stories of heartbreak that reach me every day through the post, I can assure you that mail order is alive, and well, and occasionally subject to fits. For some machines it is 100 per cent of the market.

One small extra point. Bob Denton, head of Prism microproducts (which distributes Sinclair computers, software and other things) recently set up a test, to see how people bought software.

Denton didn't ring up shops and say: 'How many Froggers did you sell last week?' or 'What was the last thing you sold?' (yes, there are people who do that). Instead, he put the software on a shelf, in fifty shops, and watched what people did.

And the really interesting thing is that people bought programs that the store managers wouldn't buy.

In other words, whole ranges of software were being rejected by buyers, but were just what the customers wanted, and what they would pay money for if they saw them in the shop.

The reason this is rather frightening is that it means that hype, bribery, kickbacks and other ways of bending the buyer's conscience is obviously well worth while. And if it is worth while, it will happen.

You and I read Top Ten charts for a simple reason: we reckon that our fellow buyers may individually be rather inept, but in a group, we have some sense of judgement. But what the Top Ten charts actually show is what is being pushed through the buyers.

According to one survey, Tandy Database is the best-selling software product of the month. You would think (wouldn't you?) that somebody inside the building where this list was printed would have read it and said: 'Goodness, that's surprising! Let's investigate this and write a story about the miracle where a minority micro with only a couple of thousand users is requiring more software than the IBM and Sirius put together, and explain why it happened.'

In a few months, most of the more obvious lunacies like this will be ironed out. The less visible ones, slipping through the gaps, will remain.

And since there is no law to say that these lists must be honest, or unrigged, these less visible gaps will be the deliberate trader-bought distortions, and honest journalists will be taken to court for saying what they are. Wait and see: it will happen.

Executive status

ITCS, a UK based company specialising in the portable computer market, has launched a portable micro called the Zita Executive.

Aimed at the Osborne market, the Zita E is a 128k, Z80-based machine running CP/M 2.2 and offering a hard disk option–ITCS had incorporated the hard disk in their earlier portable, the Zita Professional.

Managing Director David Lewis-Pryce has forecast sales of around 1500 Executives by the end of the year and some 5000 more in 1984. Whether this target will be achieved remains to be seen; the Zita Professional, which Lewis-Pryce earlier claimed would 'knock Osborne out of the market', has achieved sales of 300 since its launch at the end of last year.

Entry level for the Executive is £1695 (exc VAT). Details on (07842) 47709.

Surya

Getting it taped

The ZX81 has long been notoriously temperamental when loading or saving programs on cassette. To combat the difficulties, Elinca Products Ltd has introduced a 'tapeloader' which is designed to alleviate loading problems by providing a constant signal that is perfectly matched to the computer.

The new unit filters out any unwanted signals and hum from the tape recorder and incorporates an audio output indicator and signal amplifier to enable the correct computer signal to be used. It also dispenses with the need for continual plugging and unplugging of leads when changing from 'LOAD' to 'SAVE'.

Retail price is £14.99 and further information can be obtained from Elinca Products on (0742) 339774.

Steve Mann

Some C news

Just a couple of points to follow up my C article in *PCW* (April). The excellent Computer Innovations C86 compiler is now available in the UK from MCP Systems, tel (051) 426 4178 for £349 plus VAT. It's available for most CP/M-86 and MS-DOS machines including the Sirius, IBM PC and DEC Rainbow. Look out for a more complete review of C86 and a few other C compilers in a not-too-distant future issue.

And while at the West Coast Faire I came across a very good introductory book to C programming, one which, unlike the standard 'K&R' book, is designed for less accomplished programmers—it even includes examples in both C and Basic to make the task of converting yourself from Basic to C that much easier. Unfortunately, I have no idea whether it's yet available here but any good bookseller should be able to find out and maybe even order it for you from the States. Just ask for *C Programming Guide* by Jack Purdum, published by Que Corporation, 1983, at $17.95, ISBN 0-88022-022-022-8. If you have difficulty, you could order it directly from Que at 7960 Castleway Drive, Indianapolis, Indiana 46250, USA, and don't forget to include $10 or so for postage.

Peter Rodwell

Joyful news

There's now a host of joysticks and interfaces for the ZX Spectrum and the only thing they have in common is the fact that they have nothing in common—games that are suitable for the Fuller joystick will seldom run with Kempston's product, etc.

Now Cambridge Computing has come up with an interface which, it claims, will work with any software—regardless of whether it has been written for joysticks or not.

Further information from Cambridge Computing on (0223) 522905.

Steve Mann

LEISURE LINES

by J J Clessa

Quickie

No prizes, no answers! What can be found at the back of a bus and at the front of a sports car?

Prize puzzle

In a certain street in East London, there are six families whose surnames are Adams, Baker, Chambers, Dawson, Eastwood and Finch.

In each family there are three children, and of the 18 children in all, there are three Malcolms, two Bernards, two Susans and two Tinas. The others are Anne, Charles, Leslie, Yvonne, Peter, Roger, Joan, Fred and George.

The families decide to select one child from the 18 to represent the street at a forthcoming festival. The method of selection is as follows:–

The families line up in alphabetical order, and within each family the children are also placed in alphabetical order. Then, starting with the first child of each family — Adams family first — the children count off alphabetically, and the first child who is 'counted' with the initial letter of his own christian name is to be the one selected for the festival.

Thus, the Adams' first child calls 'A'; the Bakers' first child calls 'B'; and so on to 'F' for the Finchs'.

Then the Adams' second child calls 'G'; Bakers' second child calls 'H'; and so on.

Finally when 'R' is reached by the third child of the Finchs' the count goes back to the start again. Also when 'Z' is reached, the count continues with 'A', 'B', etc.

After 20 times through the alphabet, still no decision has been reached, so the families decide to call it a day and choose instead the only child of Mr and Mrs Grant, who also live on the street.

What are the christian names of the children in each family?

Answers please — postcards or backs of envelopes only — to reach *PCW* by 31 August, 1983. Send your entries to: *PCW*, August Prize Puzzle, Leisure Lines, 62 Oxford Street, London W1.

May prize Puzzle

A good response — about 180 in all — of which about 30 were disqualified because they were not on postcards or outsides of envelopes.

Now, to the May winner — drawn by random selection from the mostly correct heap. The correct entry was from Les King of Ormskirk, Lancashire. Congratulations Mr King — your prize is forthcoming.

Meanwhile, to all others, keep trying, your turn might be next.

The winning solution was:–
Celia was the Mother; and
Doris was the Daughter.

NUMBERS COUNT

Indefatigable Mike Mudge continues to reveal his zest for numbers.



HARSHAD NUMBERS IN THEORY AND PRACTICE

In the *Journal of Recreational Mathematics*, Volume 13, 1980-81, D R Kaprekar defines a Harshad Number (H-Number) for d as a number that is a multiple of the sum of its digits, d. For example, 247 is an H-Number for 13 because 2+4+7=13 and $247 = 13 \times 19$.

Clearly every positive integer less than 10 is an H-Number for itself. Kaprekar states that there is at least one H-Number for each positive integer, hence there is an infinity of such H-Numbers, since if N is an H-Number for d then so is $10^{\cdot}$H for n = 1,2,···. N is said to be a Non-Zero Harshad Number (NZH-Number) for d if it is an H-Number for d and *none* of its digits are zero.

Note: The number of NZH-Numbers for a given d is clearly finite and the difference between any two of them is by definition a multiple of d.

Problem A: Given d, a positive integer, find the smallest H-Number and the largest NZH-Number for d.

Problem B: Generalise the above results to arithmetic radix $r \neq 10$. Known theoretical results include the following:

If $m = 3^S$ then

(i) the largest NZH-Number for m is the Repunit R_m defined by $(10^m - 1)/9$. viz. a sequence of m 1's.

(ii) the smallest H-Number for m is $9R_n$ where $n = 3^S$-2.

Known practical results include the following:

(i) 37999 is the smallest H-Number for 37

(ii) 2918999999999 is a small H-Number for 101

(iii) 8587 followed by 27 nines is a small H-Number for 271.

Are (ii) and (iii) the smallest H-Numbers?

Readers are invited to submit a program, or suite of programs, to solve the above problems. All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency (not necessarily in that order). A prize of £10 will be awarded to the best entry received.

Entries, to arrive by 1 October, to: Mr M R Mudge BSc FIMA FBCS, Room 560/A, Department of Mathematics, The University of Aston in Birmingham, Gosta Green, Birmingham, B4 7ET.

Steinhaus Problem

The Steinhaus problem attracted detailed submissions in both Basic, assembly language and Z80 Machine Code on hardware including a NewBrain AD, BBC Micro, and ZX81. Undoubtedly the 'best' submission was that programmed in assembly language on a TRS-80 model one 16k, the machine language program being down loaded onto a 48k ZX Spectrum for running. This technique adopted by Gordon Grant of 305 Stand Lane, Radcliffe, Manchester, M26 9JA allowed the determination of all cycles for orders from 2 to 12; the results being printed on a Tandy line printer VII. Gordon can expect a bonus for the orginality of his approach in the form of a publication in one of the mathematical journals.

A cheque for £10 is on its way to Manchester and it is hoped that Gordon will advise readers of *PCW*, through the correspondence column, of the progress with his attempts at publication.

Note: Submissions will only be returned if suitable stamped addressed envelopes are included.

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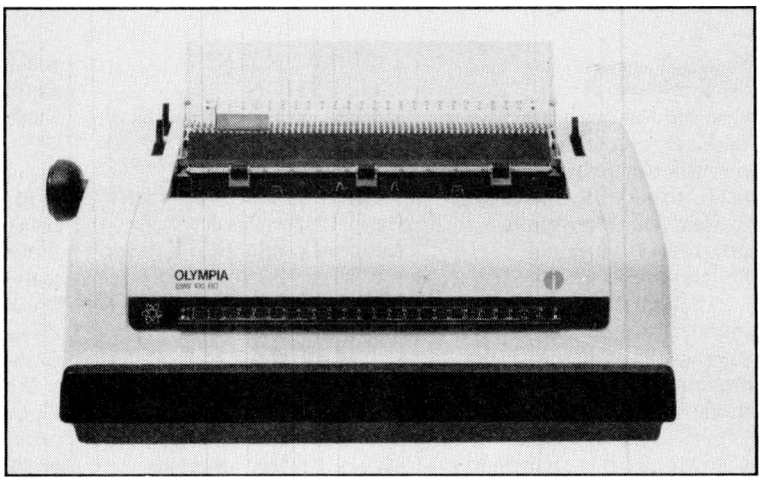

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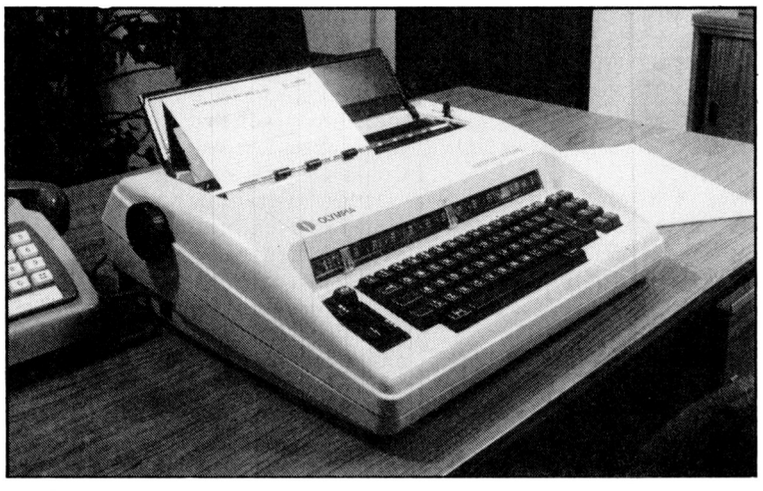

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COMMUNICATIONS

PCW welcomes correspondence from its readers but we must warn that it tends to be one way! Please be as brief as possible and add 'not for publication' if your letter is to be kept private. Please note that we are unable to give advice about the purchase of computers or other hardware/software —these questions must be addressed to Len Warner (see 'Computer Answers' page). Address letters to 'Communications,' Personal Computer World, 62 Oxford Street, London W1A 2HG.

Devious

Congratulations on the Lisp based version of ELIZA published in the June issue. It is useful to have the chance to examine this often quoted program in its original language.

I thought this program was intended to emulate a psychiatrist. Your particular implementation seems to be modelled more on a politician as may be seen from the following early exchange. My lines are indented.

(ELIZA)
HOW DO YOU DO?
PLEASE TELL ME YOUR PROBLEM
WHAT IS 2+2?
WHY DO YOU ASK?
I WANT TO KNOW THE ANSWER
WHAT WOULD IT MEAN TO YOU IF YOU GOT TO KNOW THE ANSWER?
IT WOULD MEAN YOU ARE INTELLIGENT
WHAT MAKES YOU THINK I AM INTELLIGENT?
YOU ARE SUPPOSED TO BE
WHAT MAKES YOU THINK I AM SUPPOSED TO BE?
YOU COST ENOUGH
WE WERE DISCUSSING YOU—NOT ME
WE WERE DISCUSSING MY QUESTION
CAN YOU EXPLAIN?
WHAT IS 2+2?
WHY DO YOU ASK?
ANSWER
WHAT EXACTLY DO YOU MEAN?
ANSWER!!!!
TELL ME MORE
DON'T PREVARICATE
HOW DOES ALL THIS RELATE TO YOUR TROUBLES?
IT DOESN'T
PERHAPS YOU SHOULD TAKE LIFE LESS SERIOUSLY
YOU DON'T TAKE IT SERIOUSLY ENOUGH
WE WERE DISCUSSING YOU—NOT ME
ANSWER THE QUESTION
SORRY YOUR TIME IS UP.
BYE

I think in future I will stick to Basic. It's less hassle.
Andrew Donald, Ilford, Essex

Protest

I take this opportunity to put forward some expression of my utter disgust over the article, by Maggie Burton, about the Colour Genie. In this article she says '. . . this machine is tempered by some serious doubts and disadvantages.' This statement seems to be supported only by the viewpoint of 'one of the *few* dealers' to whom she spoke concerning this unit. Statistically this would not be represented as an average population sample, and I would therefore suggest that it is totally unrepresentative of the Colour Genie as a whole.

If this dealer is to be believed, some 75 per cent of his units were returned to Lowe Computers. Since I was the first dealer to have supplies and sell the Colour Genie I feel in a position to give some concrete facts about this particular machine.

The return rate either to us or to Lowe has been of the order of 5.9 per cent, which leaves a margin of some 69.1 per cent from the stated figures. It may be possible that I have had a better sample of machines than the average user but Lowe reports a 7.19 per cent fault rate.

My original test machine was supplied at the *PCW* Show last year. This unit has been in constant use since September last and in fact has not been switched off for more than ten minutes at any time since—a record which any machine would be proud of and on which I put great emphasis. Maggie Burton also says that the power supply runs hot; a fact which again I would challenge as in comparison with other machines it is in fact a cool supply. It was mentioned that there appeared to be provision on the board and in the case for an internal speaker; this is so. With the addition of one BC 107 transistor, two resistors and an 8 ohm speaker, internal sound is there. One point about using the TV, you can turn the sound down which is not possible on units such as the BBC micro.

It has been said that the Colour Genie has not one exceptional quality, that is true: all its qualities are exceptional.
Duncan S G Spencer, The Ipswich Computer Centre

Cross-figures

As a long-time fan of the cross-figure puzzle I was very interested in the article by Philip Lewis (*PCW* June).

When I first acquired a microcomputer I, too, tried to use it to solve a cross-figure puzzle and came up with a program that would have run for a few thousand years. I concluded that these puzzles were not suitable for programming and went on to other things. Now that I know that programs are feasible I'll try it again!

Incidentally the type of puzzles discussed by Mr Lewis are not the last word in cross-figuring. A few years ago an extraordinary series of puzzles appeared in *Games and Puzzles* magazine, written by a compiler who used the name 'Rhombus'.

On the left of each identity there are three 3-digit primes together containing the nine digits (zero excluded). Capital letters denote Across lights, small letters Down lights.
D/2+j/3+(E−N) = 999
D/2+E/3+c = 1089
D/2+j/3+G = 1269
b/2+k/2+M = 1359
f+C/2=K = 1449
d/6+J+K = 1539
e/2+(3g−2f)=h = 1629
H+B+a = 1809
H+F+a = 1899
J+M+A = 1989
Games and Puzzles (Spring 1980)

Finally, why not add to your already excellent coverage of the recreational mathematical area (Mike Mudge's 'Numbers Count' series has been most interesting) by publishing a regular cross-figure puzzle!
G J Suggett, Chichester, Sussex

Anyone else interested? — Ed.

Double trouble

Congratulations on your program Pascal Double Trouble (*PCW* May) which was not only easy to read, but also ran the first time I tried it.

I would like to make two points about this program. You claim it is restricted to a compiled Pascal because of the number of computations that have to be made—an interpreted language being too slow. If you have run it, you will notice that it 'stutters' at times, particularly as the levels are raised as the game progresses. I have found this is due to the not very efficient FUNCTION generating the random numbers, which is required to keep producing them until one falls within the range nominated by the actual parameters. It is much quicker to generate a random number to fall within the required range and the FUNCTION can be changed to:

```
FUNCTION Rand
(x,y:INTEGER):INTEGER;
BEGIN
    Rand:=RANDOM
MOD(y-x+1)+x
END(*Rand*);
```

With this change you will find the game proceeds more quickly and smoothly. (The standard function RANDOM in this Hisoft 4T version of Pascal gives an integer in the range 0–255.)

The other point is that the stated memory requirement of 43k for source code alone is wrong and may put off some people from trying it. I find the source code only takes about 17k. There is plenty of room in my 48k machine for the Pascal compiler and editor (16k),

source code and compiled code at the same time.
C B Brown, Chesterfield

Only Ada

I have noticed that whenever you have an article about Real Time languages you only seem to mention Ada, which I believe only just about exists at present. Do you not know of Coral 66 or do you prefer to ignore it?

I agree that there are not many (if any) implementations of it on micros, but surely the same could be said of Ada?
Paul B Nix, Stockport

We are always interested to hear about applications of Coral 66 — Ed.

Numbers

With reference to the series 'Numbers Count', would it be possible for you to explain or indicate some of the techniques used by those who manage to solve the problems, either with the article or in notes for which we could send?

Alternatively could you suggest reading references to any particular technique?
D P Kent, Ashford Common, Middlesex

PS Thanks for a grand magazine.

We're working on it — Ed.

Blame

It was with interest that I read Guy Kewney's open letter to Chris Curry, and M J Bicknell's (Acorn Customer Service Department) letter praising his most ineffective customer services department (*PCW* June).

My own experience of both Acorn and its much publicised 'Customer Service Department' is one of complete frustration.

In February '82 I ordered a model B with disk interface, eventually received in September '82. The machine ran until November when gross interference on television appeared, diagnosed by Acorn's agents as dry soldered joints in the UHF section. This took the whole of December to fix and the repaired machine returned mid-January '83. In February I received my long awaited disk drives.

Unfortunately my joy was short lived as after one hour of operation another breakdown occurred. This time the Acorn agent in Glasgow (Esco Computing Ltd) diagnosed a faulty disk controller chip and immediately ordered a new chip. Six weeks later as nothing had happened I wrote to Acorn and received a reply on 26 March extending the guarantee till the end of June '83. A further six weeks passed and still no chip. On writing again I received a communication stating that the agent had not followed correct procedures and that before a replacement chip could be supplied the faulty chip would have to be returned.

It is now over four weeks since the faulty chip was returned and still — no further forward — I now despair of ever having this machine fully operational ever again.

It is lamentable that such a good design should be spoiled by what appears to be a completely incompetent organisation with no thought of service back-up. I only hope that our friends abroad realise their chances of service must be even slimmer than those of us in the UK.
J W Downie, Beith

Index

Now that your 'Back Issues page' fills two pages, the format which gives contents, issue by issue, is becoming less helpful. For those of us who want to find whether *PCW* has covered a particular topic in the past (and that must be true of most readers of 'Back Issues'), a format similar to that of your annual index, updated monthly, would be much more helpful.

Any chance of this?
R Phillips, Milton Keynes

Point taken — Ed.

Praise

In these days of frustration caused by manufacturers' lack of documentation and support for their products, may I put in a brief word of praise for the efficiency of Tandy, whom I contacted recently with a technical matter concerning their PC2 personal computer.

Not only was the enquiry handled with knowledge and understanding, but the solution to my problem was provided within a very short time.
J Bland, Birmingham

Honestly!

I was pleased to see recently that Commodore has taken to heart the comments in Chip Chat about truth in advertising. The new advert for their 'cardboard cutout' 700 series computer truthfully proclaims 'It's a picture' . . . It certainly isn't a computer!
Stephen Burt, Antibes, France

Pay-off

I was interested to read Mr S J Harris's letter in your June issue. I too have had problems with selling software via Bug-Byte.

In February 1982 I signed an agreement with Bug-Byte to market my program 'Constellation' for the Sinclair ZX81. This agreement required Bug-Byte to pay me royalties at three-monthly intervals. After a number of telephone calls to Bug-Byte, I received my first and only royalty cheque in July 1982. This cheque promptly bounced. However, the cheque was honoured when I re-presented it.

Since then I have received no further payments. All my telephone calls have been met with evasive answers, and all my letters have been ignored.

This behaviour is in stark contrast with the prompt payments I have had from Molimerx (A J Harding) and Program Power, which sell the TRS-80 and Nascom versions of this program.
J M Rogers, Bristol

Cynical

I was interested to read your review in the June issue of *PCW* of the Basic compilers currently available for the ZX Spectrum. However, for me the article left a number of questions unanswered. The introductory comments were rather cynical with regard to both the improvements in program speed and the 5 per cent of Basic not tackled by the compilers without providing explicit examples. I am sure that many of your readers would have been very interested to see *PCW* benchmark results for the compilers reviewed as well as a table of the ZX Spectrum Basic commands which could be used with each of them. It would also have been useful to know how the compilers compared in the compactness of machine code produced for a particular example of a Basic program.

These omissions from the review lead one to suspect that the various compilers were not even loaded and tested and that the information presented in the article was merely gleaned from the instructions provided with each product. I am sure that my views are shared by many other readers and I look forward to seeing a more comprehensive review of Basic compilers for the ZX Spectrum.
A Tobias, Bristol

I certainly was cynical about the missing five per cent — which includes floating-point arithmetic and string-handling. All the compilers were tested, but the article was designed to be a look at various Spectrum enhancements, not a complete review of individual products. A fuller review of Basic compilers — plus Forth and Pascal compilers — is scheduled for a future issue — Steve Mann.

Dorked

While glancing through the April 1983 issue of *PCW* I came across an article on page 126 about the revolutionary program generator 'DORK'. I must have missed it the first time round when I read the magazine in April or perhaps I only glanced through it. What immediately struck me was that one of the authors' names is suspiciously like a spoonerism for a name I have heard somewhere before, namely, Julian Allason. I suppose Brad Robinbeer is also a pseudonym (perhaps the emphasis should be on pseudo — Greek I think meaning 'false').

I have since scanned the pages of the May and June editions of *PCW* and can find no further mention of what I am sure was a superb April fool's joke. Has nobody else noticed it, or have I simply double-bluffed myself?
R Andensa, Lincs

PCW *was either too clever or too stupid — nobody else has responded! — Ed.*



BANKS' STATEMENT

STANDARDS OF EXCELLENCE

Prepare for Martin Banks' harangue: this month he takes up the issue of standardising software.

I have this overpowering urge just at the moment to go around thumping tubs. Every so often, the feeling changes and becomes an urge to go around standing on giant-sized packets of Bold Automatic telling everyone what I think. Yes, I'm afraid I'm feeling ever so slightly evangelical again.

Now, those that know me well will be fully conversant with their plan of action from now on. They will instinctively know what to do about this situation. They will go down to the pub and pray that I don't follow. But those less experienced will be trapped as I regale them with strong views and high principles that will set them thinking, or not, and have them agreeing or disagreeing with me.

'The simplest way would be to standardise the format and media of the software products.'

It will be interesting to see if anyone agrees with me on the following subject (over which I am feeling evangelical, remember?). Like nuclear disarmament and full employment, everyone seems to think it is a wonderful idea, in theory. In practice, however . . . well, you know.

The subject, to put you all out of your misery at the earliest possible convenience, is standardisation and, in particular, software standardisation.

Now to many, this may sound like the prize-winning yawn subject of the month. Some may be thinking that they are now in for a tedious diatribe on block structured, object-oriented programming techniques that will be blindingly esoteric, and interest just three people in the country. But nothing could be further from the truth. What I am waxing evangelical about is simple, straightforward, and will interest everybody . . . everybody except the manufacturers, of course.

You see, when I start wittering on about software standardisation I mean precisely that — software to a common, set standard. This does not mean a standard of performance or taste, though I personally feel that quite a few of the games (and 'games') programs leave a great deal to be desired in both areas. Instead this means standards of operation and use.

At a time when the home computer is becoming one of the most spectacularly successful products of all time, and when the home software market is (by definition) in line to overshadow that success many times over, everything should be done to make the way to that success as smooth as possible. This seems sensible both from the industry's and the user's point of view.

The simplest way of clearing such a path would be to standardise the format and media of the software products. This strategy has already been shown to work — up to a point at least — with CP/M in the small business systems market. Here, the sales of both systems and software increased greatly with the acceptance of CP/M as a standard operating system. It broke the hold of Commodore, Apple and Tandy (as the three main proprietary hardware suppliers) over the software products market. Thus it also gave other hardware and software suppliers a chance to sell their wares competitively.

The same opportunities are arising in the home computing market. There is a palpable need for the equivalent of the standards found in the music business. It is true that the punter can buy records that are to differing standards but they are limited in number and, more importantly, not limited in hardware compatibility. My 45rpm and 33⅓rpm 'hard' discs will play on my Hitachi hardware just as well as on your Sony, or someone else's Quad hardware.

The cassette end of the music business is even more standardised, where everything from format to 'datarate', and even packaging, are the same. Only the important bits — the label and the actual data — change.

The same, sadly, cannot be said of computer software. A good game on one make of hardware cannot be used on a different machine. If there is any need for information transfer between users (and, therefore, machines) of any description whatsoever, it can only be achieved through third party systems such as MicroNet or BSTAM on CP/M. I cannot take my game from my computer and play it on yours, unless it is the same make, but I feel that is what I should be able to do.

Now, I say this not from any pernickety desire to show off a particular game to others. I say it because such an ability would benefit the users and potential users alarmingly. Suppose that software could be purchased in the same way we currently buy records. Do you ever hear anyone go into a shop and request, for example, a Paul Simon record, in CBS 43⅛rpm data format, to fit a Sony 9⅞in reversed disc player?

Nope. But this is precisely what has to happen when you buy software for your personal computer. You have to remember what type it is, how much memory it has, what version of Basic is installed and what version of the operating system is present. Get one of those wrong and the software purchaser has wasted money on a useless lump of plastic.

The reasons why there are no such standards are easy to see, and they relate to some extent to the youth of the industry — it has not been around long enough to get its act together properly. Yet they also stem from pride and avarice within the industry, and that ain't good.

The pride comes from the understandable desire for a company to stick by what it has designed. Obviously it feels its design is the best, otherwise it wouldn't have designed its computer that way, would it? The trouble is, even though a company feels it has the best, most elegant solution ever invented, that design may not be the best solution for the majority of users and potential users.

The avarice comes from having a successful proprietary hardware architecture, and wanting to follow it with continuous and profitable software sales.

By each aiming at its own, personalised, crock of gold somewhere out there in the future, the majority of manufacturers, unfortunately, will miss the boat and the money. The reason is simple: there is just not enough room in the market for all of them to be successful in that way.

'The lead will presumably come from the third party software producers working synergistically with the users.'

Two factors emerge here. One is that no matter how much a company tries to protect its proprietary rights in the hardware (and therefore the software), all it will really achieve is an increased cash flow for the legal profession. The second is that it is much better to have 10 per cent of a very large market than 100 per cent of a tiny one. Put the two together and it is possible to see that, for the majority of the manufacturers, having a proprietary product does not — in the end — mean much.

Even companies the size of Apple, which is big in the business by anyone's standards, have wasted time and effort

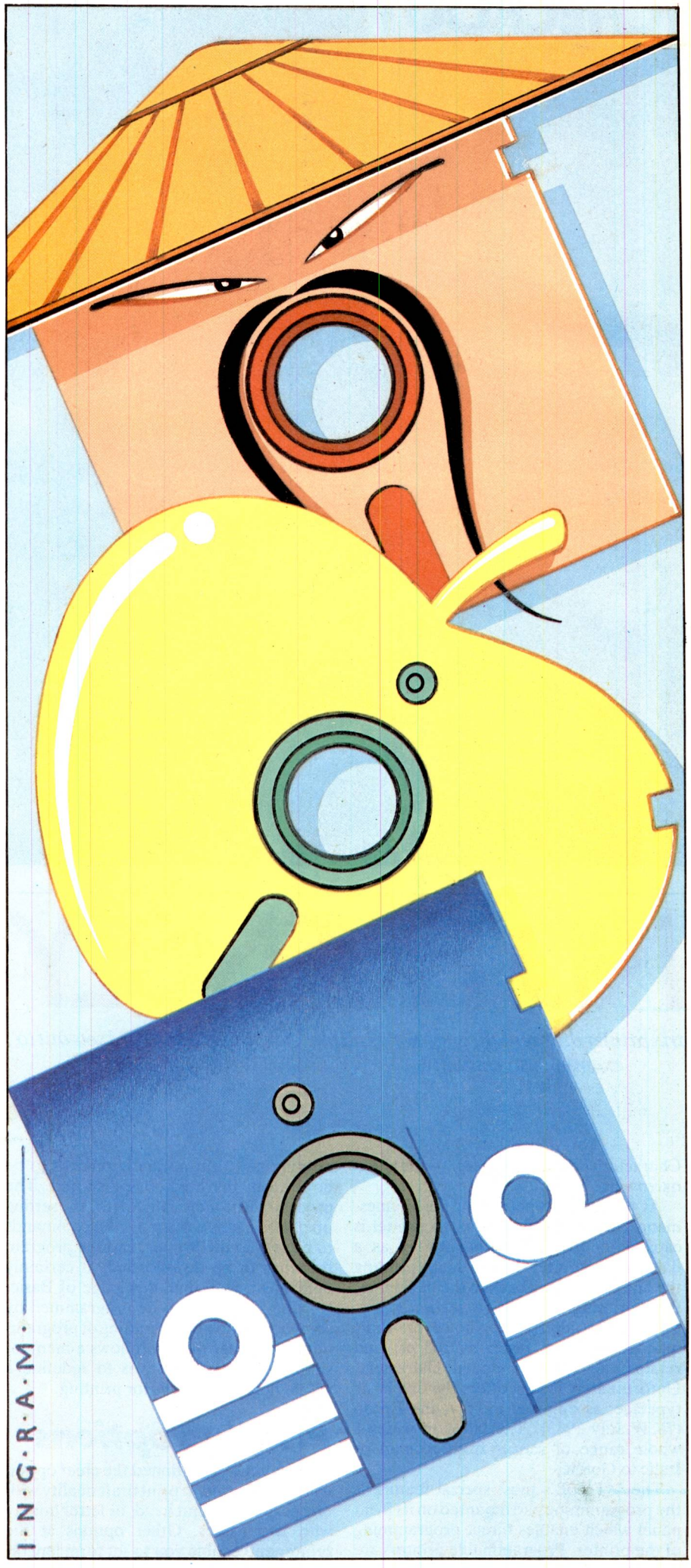


Illustration by Roy Ingram

fighting the oriental clones. The money invested in that protective exercise could have been better spent on producing more software with which to service the expanded market created by Japan's entry into the foray. Or it could have been used to get the company's formats accepted as the industry standard — perhaps.

For how will standards be achieved? That — as Hamlet *might* have put it — is the question. Ideally of course they would come from the industry talking among itself about how to achieve such a thing. This has happened to some extent in the business area with the formal acceptance of CP/M. It is coming along more, though very slowly, with the appreciation of the fact that standardisation on the format of floppy disks is the next big important step. Digital Research is lobbying hard here, but so far without success.

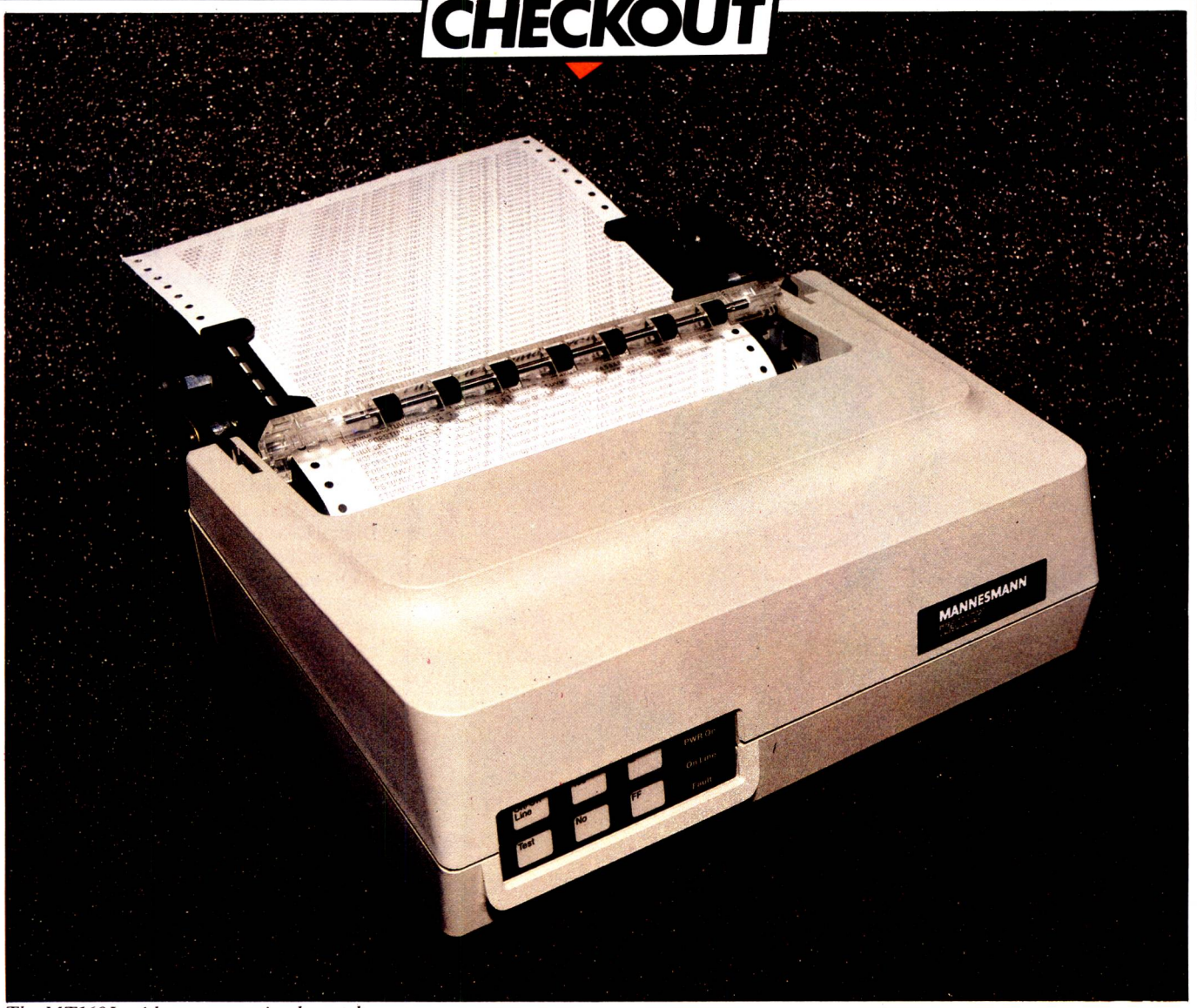
Of course, with CP/M the standard came largely by formal acceptance of what was already there, so maybe the same will happen in the home computer area. There is also a parallel with CP/M to be found in the words of Mike Healy — UK managing director of Osborne — on this very subject. 'It is very important that there is a standard. It is not so important what makes up that standard.' This is certainly the case with CP/M, as many of its 'fans' have observed before.

The lead will presumably come from the third party software producers working synergistically with the users. The biggest sellers of hardware will attract the most program writers, so the chances of a good one showing up are that much higher. That good writer will produce the good programs to attract more users to that specific machine, which will increase its sales, and so the loop will continue.

By extrapolation, it might well be supposed that the future standard format for home computer software will come from one of the successful manufacturing companies — such as Sinclair or Commodore — by a process of default and market economies. If this does happen in the end I just wish they would get on and settle it quickly, so that the users and software writers can get down to buying, using and writing programs.

A bit of self-discipline by the industry in quickly getting this important area constructively sorted out would benefit everyone — the users (who, they?), the software writers (among whom there have to be some future millionaire megastars), and the manufacturers.

As a final thought on this subject there is one alternative suggestion I have to make. Like the subject of standardisation itself, it is one that I have made before, but I won't let that stop me. One way round this whole problem is for someone to circumnavigate it completely by producing a computer that can run any type of software, regardless of format. I've heard of people working on the idea of a universal machine. They say that, technically, it is quite feasible — and feasible at a reasonable price. That's what they say, anyway. **END**



The MT160L with programming keypad

FAST AND FRIENDLY

Is Mannesmann Tally's 160L dot-matrix printer the breakthrough we've all been awaiting? Jane Bird sets out to examine its versatility.

For a long time there has been a clear choice between two types of printer to use with a micro. Ignoring special purpose printers such as thermals for portable machines, the options have boiled down to the dot-matrix for draft quality or the daisy-wheel for a final proof. (This last is termed letter or correspondence quality because it creates the kind of professional looking document that might impress the likes of your bank manager.)

It has also been the case that the high quality option came at a price. Daisy-wheel printers are a lot more expensive than the draft quality alternative. And despite their price they are slow. Dot-matrix printers generally spank through at a pace to cause the superior daisy-wheel to blush.

But the clear choice is becoming murky. Characteristic of this industry — the gap is narrowing.

At 40 characters per second the Mannesmann Tally MT160L dot-matrix printer is capable of printing as beautifully as a daisy-wheel printer. It does this by printing the line once, going back to the beginning, then printing it again (a second pass). There is an alternative, however: draft quality, which is faster at 160cps, and retains the nicely rounded characters. Unfortunately it only offers the one basic typeface, as opposed to, say, the Epson (*PCW* July 1983). The latter provides a whole range of scripts from Roman or Italic to Gothic.

The MT160L's most special feature is the programming pad mounted on its front panel which enables direct programming of the printer. Programmable printers are nothing new, but normally this has to be done from the host computer end. The process can be tedious involving the setting up of Basic files containing the commands to be sent to the printer, and the program then has to be downloaded. It certainly demands a working knowledge of Basic. But the MT160L can be programmed by somebody who knows nothing of programming. The user merely follows a menu of simple yes/no alternatives to redefine a whole range of options for printing.

Printing options

I have already mentioned the chief option which allows you to print draft quality with one pass of the print head, or letter quality with two passes. Other options at the printer end enable you to set form length,

lines and characters per inch, line feed and slash zero. There is a range of foreign character sets, too: American English, Norwegian, Swedish, German, French and Spanish. For a full list of programmable parameters see Fig 1.

Programming the printer

This is done using three keys on the touch sensitive 6-key pad situated at the front left hand side of the machine: the YES, NO and TEST switches. You put the power on by means of a rocker switch at the side and at the same time a green LED is illuminated at the front. To program the printer you then need to ensure that it is offline. For this you use the top left key and the corresponding white LED will go off. You are now free to change the parameters.

First it is sensible to examine the current settings and these can be listed with one press of the NO key. To change them you enter programming mode by pressing YES and NO together. However, one point I found very annoying here was that if I made a mistake during programming the printer, there was no way I could go back and correct it — you have to exit programming mode and re-enter it. Furthermore, it is impossible to restore the previous setting: the RESTORE option only works to restore the defaults. This makes for problems if you're setting up a very specialised format involving the constant refinement of parameters and printing out pages between to see how they look.

Pressing YES with NO sets in train an interactive listing of the options. They are organised in a set/subset structure so that you skip the alternatives of options you don't wish to change (see Fig 1). If you don't want to change print format then you are spared the tedium of answering 'no change' to the complete list of print format options. On the other hand, if you want to change from draft to correspondence quality proportional spacing then you will have to input six 'no's' before you can input the yes response to the 'CORR. QUAL. PS? you want. However, this problem stems from the fact that the printer restricts programming to the use of simple YES/NO keypad. As such it works well and is a breakthrough for printers even if the job can be done more efficiently from the host machine.

If, as I did, you get completely confused at any point in the reprogramming of the printer then you can take the easy way out and restore the defaults as set by the manufacturer. Not all the options are immediately comprehensible (see Fig 1 again). This is a shame given that Mannesmann Tally has otherwise provided a machine that can be programmed by the computer-naive.

The menu

CR implies LF? This option (carriage return implies line feed) is provided because some computers do not want a printer to move to the next line on a CR command. They may want to stay at the same line for tasks like underlining. I found that with a CR implies LF? set at YES, I got underlines printed twice on two lines beneath the associated text. Also, if I had specified that a block of test should be printed in bold, the effect was to print it twice since the printer would do a line feed before going back to give the text a second pass. These quirks can be exploited for special effect but you need to play around with your computer to find out how to use the settings.

The next option is LF at full line? If you answer NO to this question and then send more than enough data to fill a line then overprinting occurs. Obviously if you are using a sophisticated word processing package to prepare the test then such problems are unlikely to arise.

Print On Paper Motion Command? If the host machine sends data CR then LF, this function is not necessary. So the default for this is NO which means that paper motion commands are carried out before printing; but printing occurs only with receipt of a carriage return.

LF implies CR? This question is only posed if you answer YES to POPC in which case LF advances paper to the next line but printing resumes in the same column where it left off.

Change Character Sets? There are a variety of options here for foreign character sets. However, these won't be much use to you unless you have a relevant

```
PROPORTIONAL SPACING *********
10 CHARACTERS PER INCH *
12 CHARACTERS PER INCH *******

THIS SPACING-TO
THIS SPACING

10 CHARACTERS PER INCH FOR UP TO 80 COLUMNS, OR
12 CHARACTERS PER INCH FOR UP TO 96 COLUMNS, OR
16.7 CHARACTERS PER INCH FOR UP TO 132 COLUMNS, OR
20 CHARACTERS PER INCH FOR UP TO 160 COLUMNS.

EXPANDED PRINT AT 5 cpi,
EXPANDED PRINT AT 6 cpi,
EXPANDED PRINT AT 8.25 cpi, OR
BOLD FACE PRINT AT 10 cpi.
```

Fig 2

```
RESTORE DEFAULTS?
CHANGE FORM LENGTH?
        4 INCH?
        5 INCH?
        6 INCH?
        8 INCH?
        8.5 INCH?
        11 INCH?
        12 INCH?
        14 INCH?

CHANGE PRINT FORMAT?
        CHANGE LPI?
                6 LPI?
                8 LPI?
        CHANGE CPI?
                10?
                12?
                16?
                20?
                CORR.   QUAL.
                10?
                CORR.   QUAL.
                12?
                CORR.   QUAL.
                PS?
        CR IMPLIES LF?
        LF AT FULL LINE?
        POPC?
        LF IMPLIES CR?
CHANGE CHAR SET?
        USA?
        UK?
        NOR/DAN?
        SWE/FIN?
        GER?
        FREN?
        SPAN?
SLASH ZERO?
CHANGE AUX CODE SET?
        NONE?
        E CODES?
        D CODES?
CHANGE COMM CONFIG?
        CHANGE BUFFER SIZE?
                MAX?
                MED?
                MIN?
        PARALLEL?
SERIAL?
CHANGE BAUD?
        9600?
        4800?
        2400?
        1200?
        600?
        300?
        150?
        CHANGE NO. DATA
                BITS?
                7?
                8?
          CHANGE NO. STOP
                BITS?
                1?
                2?
        CHANGE PARITY?
                NONE?
                EVEN?
                ODD?
        CHANGE BUSY?
                LOW?
                HIGH?
        CHANGE COMM PRO-
                TOCOL?
                NONE?
                XON/XOFF?
                ETX/ACK?
 END OF MENU
```

Fig 1

HOW CAN YOU MAKE AN INTELLIGENT DECISION WITHOUT US?



Ten years is a long time in the computer business.

And ten years' success at the most demanding end of the business, the OEM market, says a lot about Cifer's capability.

The microcomputers and intelligent terminals we are making today have a power, a flexibility and an upwards capability which makes it unlikely they will be outgrown or outdated in the forseeable future. And we can see further ahead than most people.

A vast range of compatible hardware gives Cifer systems functional abilities which are well beyond the scope of other equipment in the same price bracket. In fact, you could say we start where the others leave off.

And as every piece of equipment is British designed and British made, you don't have to go halfway round the world for good customer support.

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Northern Area Sales
Tel: Nottingham (0602) 410551.

South Eastern Sales
Tel: 01 935 4437

FAST AND FRIENDLY

keyboard. There is also a slash zero option.

Change Auxiliary Code Set? The printer is supplied with the standard American National Standards Institute (ANSI) code set but it can be changed to D-Codes for Daisy software or E-Codes for Epson software.

Change Communications Configuration? The default for this is parallel but you can also set the printer to receive serial data. This completes the Menu options. At this point your choices will be stored and retained even after the power is switched off.

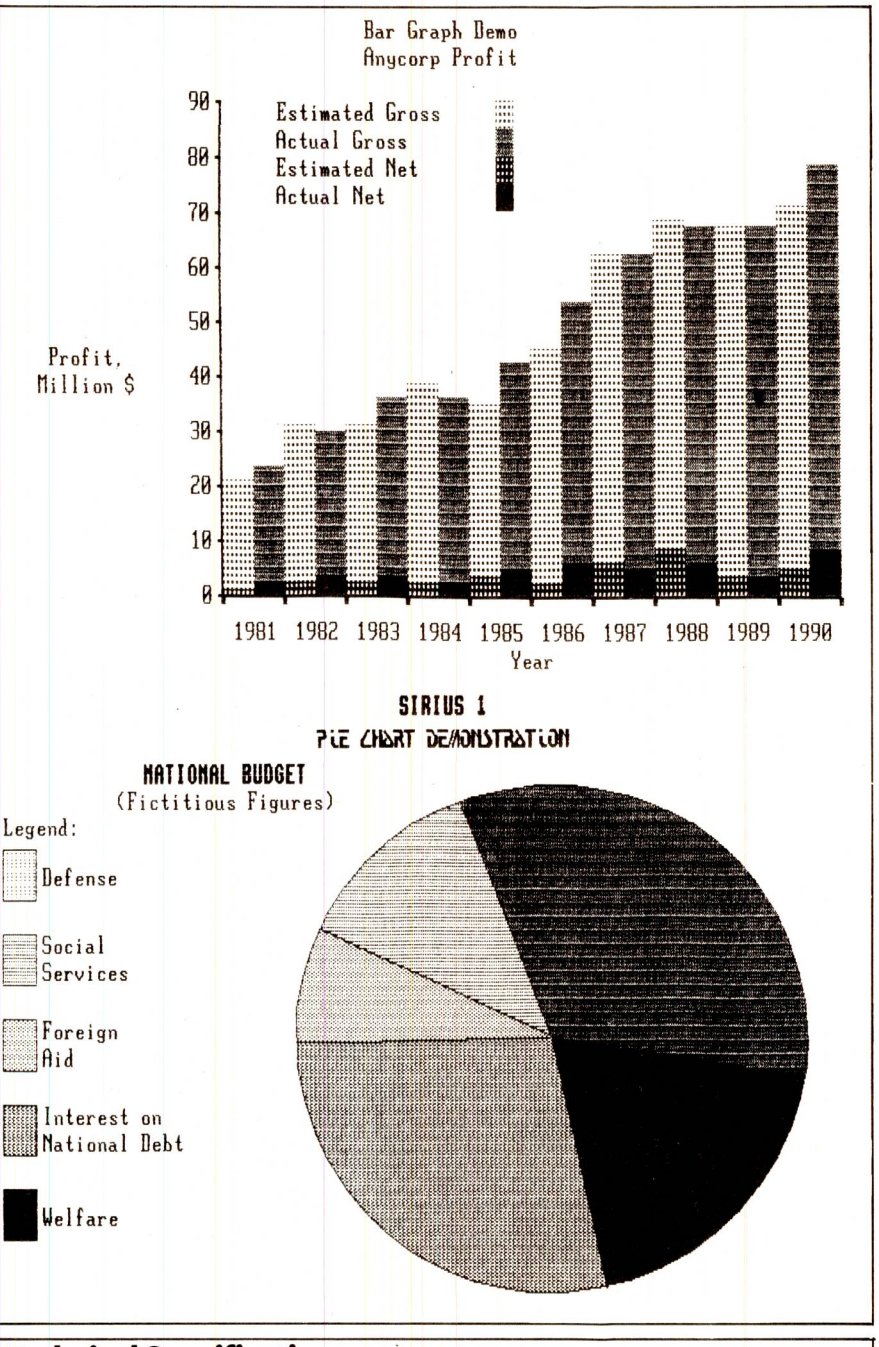
These options — and more — are attainable by sending codes from the host computer.

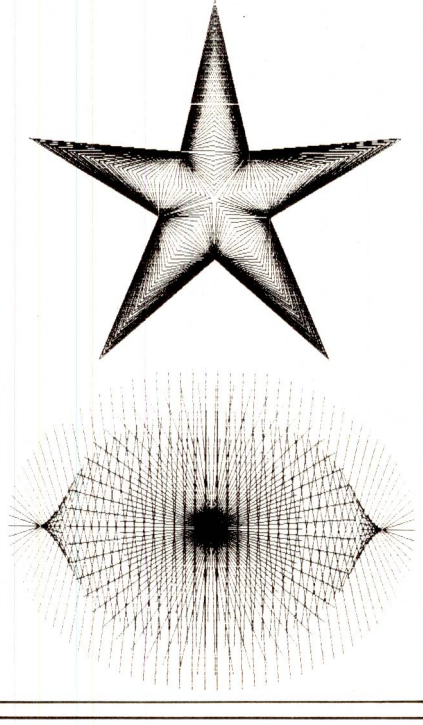
Sending programming instructions

This is a little more complicated but it does allow you to do more things. You can specify the beginning and end of underscored sections and set new margins and tabs. Text can be centred on the paper and expanded or double width characters can be produced (see Fig 2). You can also flag the beginnings and ends of superscripts and subscripts.

I mentioned that the process of programming the printer from the host is more complicated than following the friendly menus at the printer end. I did it by setting up Basic files and then down-loading them by means of the LPRINT command. A code consists of a string comprising ASCII control codes and literals. For instance, the string to select 10 pitch correspondence quality printing is ESC[4y where the ESC is sent as a decimal number and the rest as literals. Or the code for setting left and right margins is ESC[n_x;n_ys, where n_x and n_y represent ASCII variables.

GOTO page 206





Technical Specifications

AC Power Requirements:	Voltage — universal switchable power supply 100, 120, 220, 240, ± 10 per cent 50/60 Hz ± 2 Hz
Input Power:	120W maximum operating; 40W maximum standby
Weight:	18 pounds
Operating Environment:	Temperature Range: 10°C to 38°C (50° to 100°F); Relative Humidity: 20% to 85% non-condensing
Number of Columns:	80 @ 10 CPI; 96 @ 12 CPI; 132 @ 16.7 CPI; 160 @ CPI
Print Speed:	DP mode - 160 CPS @ 10 CPI Graphics - equivalent to 160 CPS @ standard density - equivalent to 80 CPS @ double density - 40% duty cycle maximum* WP mode - equivalent to 40 CPS *The graphics duty cycle specification limits the firing of any hammer to an average of 40 per cent of its maximum allowable positions over the area of a page (11 inches)
Copies:	Optional Roll Paper Holder: Original plus 2 copies. Optional Tractor Feed: Original plus 3 copies
Paper Width:	10 inch Width Maximum
Character Spacing:	Standard width characters, 10, 12, 16.7, 20 characters per inch; Double width characters, 5, 6, 8.3, 10 characters per inch
Character Set:	96 US ASCII plus 27 international characters. Modified Sans Serif standard font style in correspondence quality print.

CHECKOUT

AMUSEMENT ARCADIA

Dedicated arcade player Tony Takoushi adds up the points awarded to the Vectrex System — the all-in-one games machine.

With the ever increasing demands being made on the domestic television by innumerable games centres, the arrival of the Vectrex Arcade System may help to ease the situation for those with more traditional demands of their televisions.

Hardware

The Vectrex System has been developed by General Consumers Electronics (GCE), and is distributed in the UK by Milton Bradley. It comes in the form of a nine inch monitor type screen surrounded by a robust, black, plastic casing. Unlike standard domestic televisions which use Raster Scan, the Vectrex uses Vector graphics with three-dimensional rotation and zoom. The Vectrex also boasts ultra high-resolution graphics (no 'stairstepping' of diagonal lines) with screen characters performing smooth twists, turns and several high speed manoeuvres which are comparable only to their arcade counterparts. The system uses a motorola 68A09 micro-processor chip in order to give more speed and power than most game centres. The excellent sound effects are produced by a General Instrument AY38912 chip; the chip has three tone generators (with a 12-bit range), one noise generator which can be mixed with any tone, three channels of volume control (one for each tone), an envelope generator, two input/output ports and sound effects including explosions, music and crowd cheering.

The game controllers come in the form of a detachable panel with a self-centering joystick (which allows as near 360° rotation precision as I have ever experienced) and four buttons (allowing thrust, fire, rotate left and right). There is also a two player facility but you have to buy an extra controller for this.

Choice of games

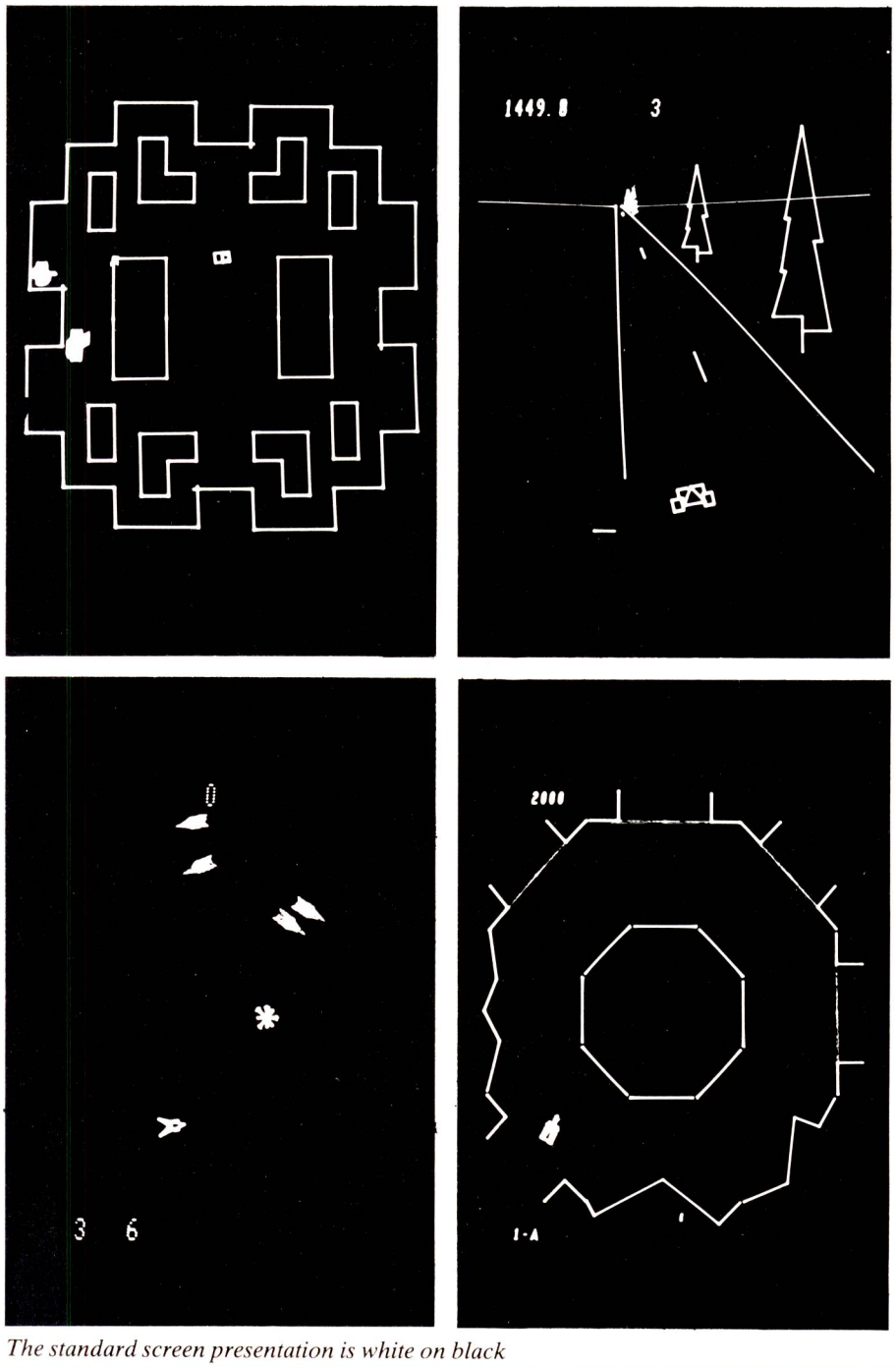
At present there are twelve games available in the form of a cartridge which is plugged into the side of the monitor.

As the machine uses Vector graphics the standard screen presentation is white on black, but this can be overcome by using the plastic screen overlays, supplied with each game, to provide colour and detail.

GCE has obtained the licensing rights for, and produced versions of, the following arcade games: Konami Industries' Scramble, Stern Electronics' Bezerk, Cinemotronics' Armor Attack, Space Wars, Star Hawk, Rip-Off and Solar Quest.

The above-mentioned seven titles are faithful 'reproductions' of the original arcade games, but only four of the titles — described below — are both absorbing and challenging.

I had reservations whether a game such as Scramble could be converted from the original Raster Scan type format (using many varied and bright colours) to Vector format. It did rather lose its edge in graphical presentation, but for arcade 'feel' and speed it is almost identical and as



The standard screen presentation is white on black

Index

No	Title	Game Type	Format	Price £	Supplier	Rating
1	Mine Storm	Asteroids	—	—		9
2	Star Hawk	Star Wars	Cartridge	20		8
3	Armor Attack	Tank/Chopper Battle	Cartridge	20		9
4	Star Trek	Star Wars	Cartridge	20	Argos,	8
5	Bezerk	Human *v* Robot	Cartridge	20	Greens,	8
6	Hyper Chase	Motor Race	Cartridge	20	Hamleys	9
7	Scramble	Defender/Bomber	Cartridge	20	and most	9
8	Blitz	American Football	Cartridge	20	good toy	7
9	Clean Sweep	Pacman	Cartridge	20	shops	8
10	Cosmic Chasm	Adventure/Maze	Cartridge	20		9
11	Space Wars	Two Player Asteroids	Cartridge	20		9
12	Solar Quest	Two Player Asteroids	Cartridge	20		9
13	Rip Off	Space Pirate	Cartridge	20		8

such must be rated one of the better cartridges available.

Armor Attack is a tank versus tank scenario (in a maze) with a helicopter thrown in for good measure. It is very addictive and has that essential (and expensive) arcade quality of 'just one more game'.

Space Wars is a battle between two opposing space ships in a hostile space field. Each player has the ability to thrust, rotate and fire at his opponent; the game being won when one ship has scored ten points. This game is particularly exciting as the higher the level (seven in all), the faster the action.



The Vectrex uses Vector graphics with three dimensional rotation and zoom.

Finally, Solar Quest is 'Asteriods' with a difference. You control a ship and must destroy up to seven different types of alien, and rescue or destroy the survivors from the alien craft, while avoiding the gravitational force of the sun in the centre of the screen. This game is particularly skilful and demands great concentration, awareness and reflex if high scores are to be attained.

GCE has also produced its own in-house games; these being, Mine Storm (this game is inbuilt to the 64k ROM of the Vectrex unit), Cosmic Chasm, Star Trek, Blitz, Clean Sweep and Hyper Chase.

Of the in-house titles there are only three truly outstanding games. 'Mine Storm' is the game supplied in ROM when a Vectrex is bought. It is a full feature (ie, rotate, thrust, fire, hyperspace, spaceship) Asteroids emulation with a little 'fine tuning' as regards the break up of the Asteroids. It is just as challenging as the original, also bearing in mind the limitations of the original as against the new deluxe Asteroids currently in the arcades.

Hyper Chase is a car race game. I originally found this game graphically crude and lacking 'playability', but after a little dedicated play (just over 1½ hours!) I was well and truly addicted. You control a car (with four gears) on a race course and attempt to pass other cars on a tenuous and winding road. There is a changing backdrop that gives a great 'feel' of depth and acceleration. This is one of the better cartridges that requires a little application to be fully appreciated.

The last game worthy of mention is Cosmic Chasm. The aim is to penetrate an alien planet, travel through its underground maze of caverns via passageways and place a bomb by the planet's power structure in the central cavern. In the outer caverns there are 'protectors' trying to ram you. To fend them off you have a force field and dual lasers at your disposal, but you must be quick and accurate as the centre of the cavern expands and will crush you if you delay in drilling to the next segment of maze. This game is unique in concept and plays well; it requires a fair degree of dexterity and 'coolness' of mind that is not found in the standard alien zapping arcade game.

Conclusions

The Vectrex is a truly excellent machine and represents 'state of the art' technology which both game enthusiasts and eager arcade players (like myself) will readily appreciate. At £130 for the monitor, one controller and an on-board game (Mine Storm), it represents very good value for money.

It is a dedicated games machine with a 64k ROM and no RAM. Milton Bradley released a conversion module to make the machine programmable at June's Consumer Electronics Show in Chicago, but a UK release date has not yet been decided. There are six new titles planned for launch at Christmas. They are Soccer, Pinball, Fortress of Norzod, Bedlam, Web Wars and Spike (Spike is the first cartridge to use the voice synthesis capability of the Vectrex unit).

SCREENPLAY

Steve Mann presents his personal selection of games for the BBC Model B, the Spectrum and the Oric.

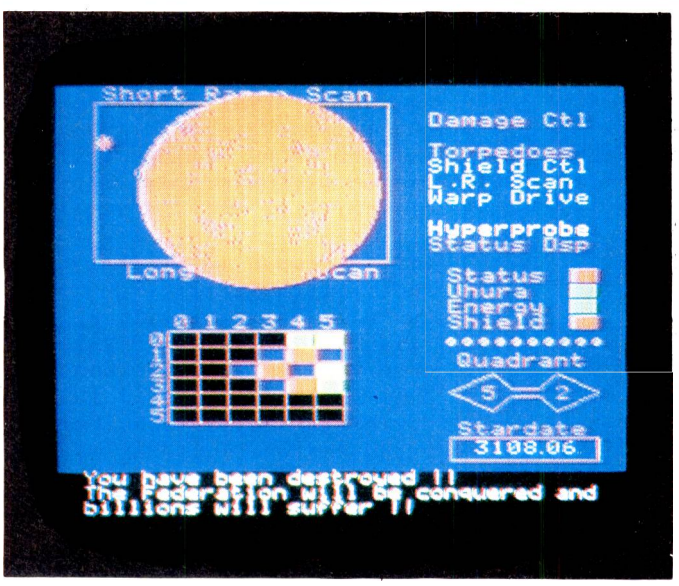
This month's column heralds the arrival of an important new name in computer software — Virgin Games. Like him or loathe him, you have to admit that Virgin boss Richard Branson knows what he is doing when it comes to marketing — from *Student* magazine to Virgin Records, Branson's high-power selling techniques have proved conspicuously successful (we'll draw a charitable veil over his one failure, *Event* magazine).

Now he is bringing his considerable expertise to the computer games field and the lessons he has learned through selling records are very much in evidence. Judging by his first batch of tapes — for the BBC Model B, Spectrum and VIC-20 — Branson seems to have his market well sussed: the packaging is slick and professional, with prominence given to the software writers (long overdue). Each cassette has a photo and potted biography of the relevant author, together with instructions, screen shot or 'artist's impression' of the game and a short questionnaire (age; male/female; occupation; magazines read; type of computer; favourite type of software). Filling in one of these entitles you to membership of the Virgin Games Gang, which gives advance information of forthcoming programs and special offers plus a place in the prize draw on 6 September with a first prize of £500 worth of computer hardware and software. In addition, each games cassette features a piece of music by noted computer freak and old hippy Steve Hillage.

Each game comes in a standard pink and blue striped package — a bit garish but undeniably eye-catching. Of course, no matter how good the presentation is, it's the content that matters and for the first batch of games Virgin is playing it a bit on the safe side. These initial programs are versions of tried and trusted favourites: Golf, Sheepdog, a Star Trek variant, a spaceship lander — there's even a Frogger-type game called 'Yomp' which is obviously based on the Falklands campaign and which invites you to lead a team of paratroopers across a busy main road. So there's nothing particularly new here — it will be interesting to see how Virgin makes out with some more original software.

It seems as though software marketing is moving away from the 'cottage industry' days of amateurs duplicating cassettes at home for sale through mail order, usually with scrappy documentation. The trend now appears to be for larger software houses retailing through chain stores. In many ways this is a pity, but the trend benefits the consumer in that tape quality is likely to be higher and back-up better — Imagine even goes as far as to offer a lifetime guarantee on its tapes: if one should ever fail to load, for whatever reason, it will be replaced free of charge. And there will always be a place for the smaller operators if the quality of their products is high enough — witness the success of Automata.

Anyway, on to the games. This month there's a mixed bag — the first two Virgin offerings for the BBC Computer, plus material for the Spectrum and Oric.



ORIC TREK

Computer: 48k Oric
Supplier: Salamander Software
Price: £9.95

The Computer gamer's old favourite. As commander of the USS Enterprise, your task is to boldly go out into the depths of space and to ruthlessly destroy the 'ravaging hordes of invading Klingons' (note authentic use of split infinitives). You are armed with photon torpedoes and phasers, and in this version you also have to be on guard against black holes and supernovae.

After a couple of false starts (the cassette comes with a 'fast' version only: it would have been more sensible to include a more reliable 300 baud version), the tape loads and invites you to choose a degree of difficulty from 0 (easy) to 9 (impossible) and a size for the galaxy (6x6, 8x8 or 10x10 quadrants). Lt Uhura then tells you how many Klingons there are and the game starts. The screen display is divided into four parts. At upper left is the Short Range Scan, lower left shows the Long Range Scan, upper right displays Damage Control and lower right gives the Status Display.

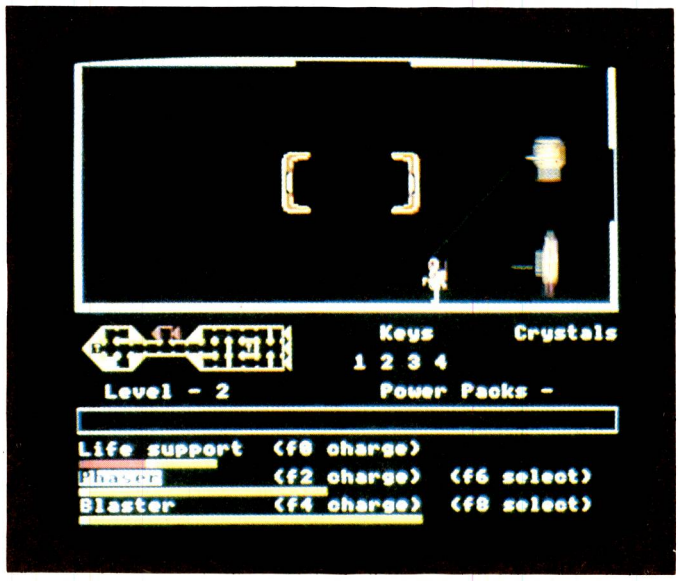
The Short Range Scan gives details of the quadrant the Enterprise occupies, showing the current position of the ship, stars, Starbase and Klingons (if any), while the Long Range Scan displays information about every quadrant so far visited or investigated. This display is updated each time you press 'L', when the Enterprise changes quadrant or when the hyperprobe returns. Damage Control appraises you of the condition of your control systems and the Status Display gives you information about the number of Klingons in your quadrant and warns you if energy is low or shields are at a low level. You are also told where the Enterprise is, the number of photon torpedoes available and the current Stardate. Status Display will also let you know if Uhura wants to talk to you. All commands are single-key entries, although these entries may need later supplementary information.

The Enterprise is moved around a quadrant by using cursor keys to engage impulse drives, and across quadrants by engaging warp drive. A hyperprobe may be launched to bring back information from distant parts of the galaxy. At all times details of the ship's condition may be received by pressing 'I'. To repair damage it is advisable to dock at a Starbase where repairs are carried out at a greater speed than when in space.

In many versions of Trek, actual battle is a fairly leisurely affair — you have plenty of time to feed in coordinates for torpedoes and phasers. In Oric Trek the action is real-time and, as the booklet says, 'If you go off to make a cup of tea there may be no ship left when you get back!' If you aren't quick enough on the trigger there is a very impressive explosion and the message 'The Federation will be conquered and billions will suffer'.

All in all, this is one of the better Treks I have played. The 12-page booklet makes all the various commands easy to understand, and the addition of the hyperprobes, black holes and supernovae make the game more involved and more interesting. Salamander has done a good job on this — every home should have a Trek and if you own an Oric you won't go far wrong with this one.

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



SPACE ADVENTURE

Computer: BBC Model B
Supplier: Virgin Games
Price: £7.95

You have boarded a seemingly abandoned alien spacecraft that is drifting in space. Your mission is to find and collect four power crystals—these are very rare and are locked away in special rooms that have only one door. To open these doors a rectangular electronic key is required—if you are carrying the correct key the door will open automatically. The keys are placed randomly around the ship and you pick them up by simply walking into them. Your power is limited—power packs are also randomly distributed and you can carry a maximum of four. The power packs can be used to charge your life support system or either or both of your two weapon systems. The weapons (phaser and blaster) are extremely important: androids protect the ship and these will attack as you enter some of the rooms. You can't leave a room until you have dealt with the androids and several hits are needed to destroy each one. The blaster is more powerful than the phaser but consumes more power.

The alien ship has three levels. Initially you are on level 2, and each level has two transporter rooms to enable you to move between tiers. Moving your astronaut is done by using key 'Z' to go left, 'X' to move left, ';' to move up and '.' to go down. Pressing two keys at once allows diagonal movement and there is also a joystick option. The function keys allow weapons and life support system to be recharged: f0 charges life support; f2 charges the phaser; f4 charges the blaster; f6 selects phaser; and f8 selects blaster. Firing is controlled by the space bar.

After loading you are prompted for a skill level (1-3), with level 1 being the easiest. The skill level determines the number of power packs available and the initial strength of the androids. As the game progresses, the androids become more difficult to destroy.

As yet I have not managed to complete the game, so I have no idea what happens when all four power crystals have been collected. Great care must be taken when allocating power to your weapons and life support: it's all to easy to get trapped in a room with a couple of androids whose firepower rapidly drains your life support. The game ends when both your weapons are drained and there are no power packs remaining or when your life support system reaches zero.

Space Adventure makes good use of graphics and colour. It's certainly entertaining enough at first playing, but I suspect that it's a game one would quickly tire of. Program writers are Andrew and Roger Thomas.

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

MONTE CARLO

Computer: 16/48k Spectrum
Supplier: Micromega
Price: £4.95

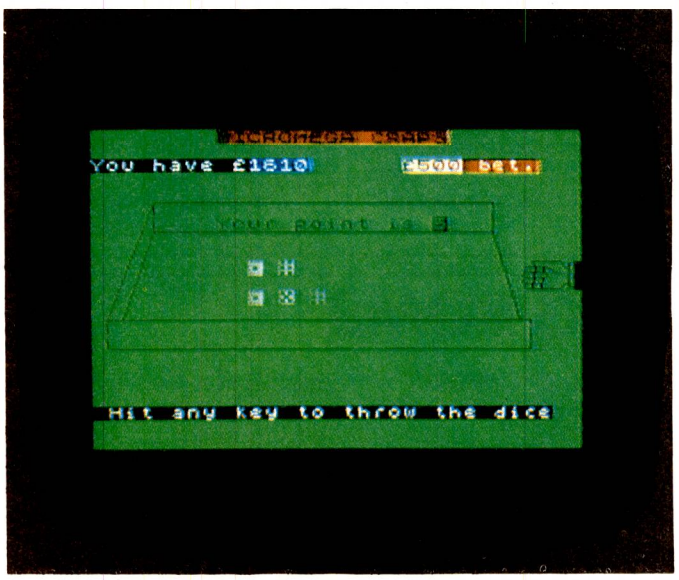
As someone who has been known to risk the odd shilling on games of chance, I was interested to see how well Micromega could duplicate the casino atmosphere in the two games on this tape—Blackjack and Craps.

Blackjack is unique in gambling games in that it is the only game that, at certain times, nullifies the banker's advantage: most casino games favour the house at all times but Blackjack—also known as Pontoon—gives the player a decided edge once a certain number of cards have been dealt. Of course, the big drawback in any computer gambling simulation is the fact that you can't actually collect your winnings—which rather destroys the point of playing. But you could certainly use a computer to sharpen up your playing technique and to demonstrate the odds against making certain hands.

Blackjack starts with the computer dealing the player a card face up and itself a card face down. You are then invited to bet any sum you like out of your initial £100 and a second card is dealt to each. The object of the game is to get as near to 21 as possible without exceeding it. After the second card is dealt you have the option of pressing 'H' for 'hit' to get a further card, or 'S' for 'stand' to stick with what you've got. After you have completed your hand the computer turns its cards face up and either stands or takes more cards until it beats you or exceeds 21. The cards are clearly marked and all the usual rules are followed—but I wish it was possible to 'buy' cards: this game allows you to bet only on your first card.

On the other side of the tape is Craps, a fast and furious dice game that, when played for real, is about as much fun as you can have with your clothes on.

Micromega's version details the dice table and a moving hand which rattles the dice until you press a key, whereupon they are tossed onto the playing surface. It duplicates casino practice by paying different odds depending on the mathematical chance of throwing certain numbers.



Those of you who have seen Brando and Sinatra in *Guys and Dolls* will understand the attraction of craps—it's possible to win or lose a fortune in a short space of time, and the game has an atmosphere and argot all of its own. My next task is to program the Fuller Orator speech unit to shout encouraging phrases like 'Baby wants a new pair of shoes' and 'Roll dem bones' at the appropriate moment. Lots of fun—but it's no substitute for the real thing.

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



AUTOMONOPOLI

Computer: 48k Spectrum
Supplier: Automata
Price: £6.00

From the team that brought you Pimania comes this excellent simulation of the famous board game Monopoly. There are other versions for various micros, but these all simply allow the computer to keep track of the state of the play, draw the board and move the pieces. Automonopoli is unique in that the computer acts as one of the players. Any number between two and five can play and, if required, the computer can act simply as a banker. But the real fun comes when your Spectrum joins the fray.

To start with you are asked for the names of the competitors (if the Spectrum is to be a player you simply type 'ZX' as one of the names) and you then choose counters from the standard Monopoly range of ship, car, iron, etc. Each player starts with £1500 and the object, as I'm sure you know, is to buy up various properties, build houses and hotels on the sites and collect rent from your opponents who are unfortunate enough to land on your square. As such it panders to character traits like greed and ruthlessness and has been excellent training for budding tycoons for years.

Automonopoli shows the board in sections of three squares at a time. After the dice have been rolled the three-square window scrolls to the left. The Spectrum's moves are made automatically, while each player has to enter an initial to move.

Pressing 'X' gives a menu of choices, allowing players to buy houses, mortgage property, swap property and check on their positions on the board. Pressing 'Enter' after keying 'X'; scrolls through the list of properties, detailing who owns what. The usual Chance and Community Chest cards are featured: these either give bonuses for selling shares, coming second in beauty contests, etc, or cost players money by demanding cash for house repairs, etc.

The Spectrum plays a good tight game and is a worthy opponent. One point to watch is that you don't overstretch your resources — if you are short of cash the Spectrum will exploit the situation without mercy. If you land on a 'For Sale' square and have insufficient funds to buy the property it is put up for sale to the highest bidder. In this case the Spectrum will invariably offer £1 more than you possess and will therefore snap up property cheaply.

I followed my usual Monopoly strategy of ignoring all the cheaper properties and concentrating on Park Lane, Mayfair, Bond Street, Regent Street and Oxford Street (one does like to live in style, don't you know . . .), together with the stations and utilities. With this game plan I took a fearful hammering as the Spectrum raced around the board buying up everything in sight. But I got my revenge at the end of the game when I trapped the Spectrum on Mayfair with two houses, which forced my opponent to mortgage all his properties to pay the rent. A few moves later it landed on Mayfair again and, having no money left, lost the game. The only drawback is that it's less satisfying hammering a computer than it is demolishing a human opponent — gloating and sneering at the loser is not nearly so much fun when you can't watch your opponent's discomfiture.

Automonopoli is a triumph of the programmer's art. The board is well laid out, the onscreen prompts are clear, and the program design is excellent. The only fault I could find is that the names of some of the sites seem to get corrupted as the program loads — so, for example, you get names like 'Pall Kent Oad' or 'Wacome Wotax'. This doesn't spoil enjoyment of the game but it does look a little strange. Apart from that — full marks: another superb game from Automata.

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

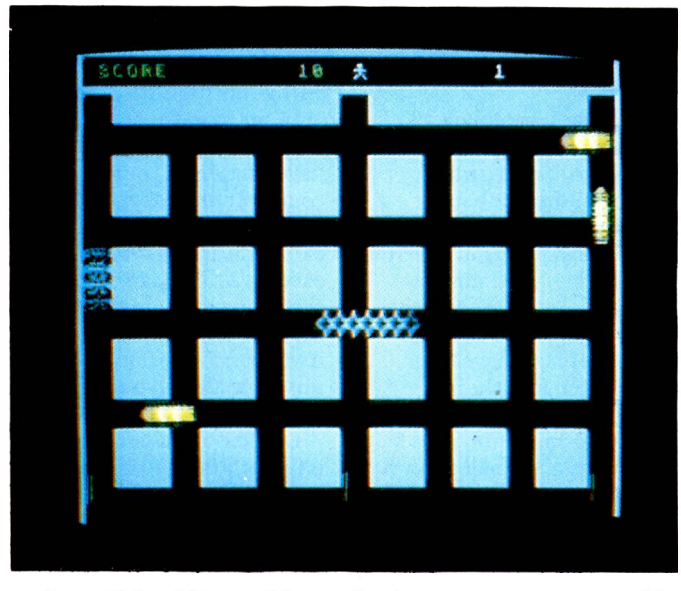
BUG BOMB

Computer: BBC Model B
Supplier: Virgin Games
Price: £7.95

Bug Bomb is one of the first releases from newly formed Virgin Games. Running on the BBC Model B, this is a simple 'maze-chase' game that is surprisingly compelling to play and difficult to beat.

The story-line goes like this: in the year 2184 men were sent down into the earth to wander the electronic grids that provided the power supplies for the cities. Their task? To rid the grids of bugs that lived there feeding on the electronic current. The hero is Henry, ace bug-hunter. You control Henry and you simply have to kill as many bugs as possible before the inevitable happens and you get wiped out.

You control Henry from the keyboard by using 'Z' to move left, 'X' to go right, ':' for upward movement, and '/' to move down. Alternatively, a joystick may be connected. On starting, the bugs are yellow and are three in number. You attack them by pressing the space bar, whereupon a projectile is fired in the opposite direction to the one in which you are moving. You have three lives and a maximum of three bullets (shells? electrical charges? — the game does not say which) on screen at once. These hurtle around the grid at some speed and stay active until they hit something. This means that you are threatened not only by the bugs but by your own weapons and it gets a bit hairy trying to dodge all the various objects. If you

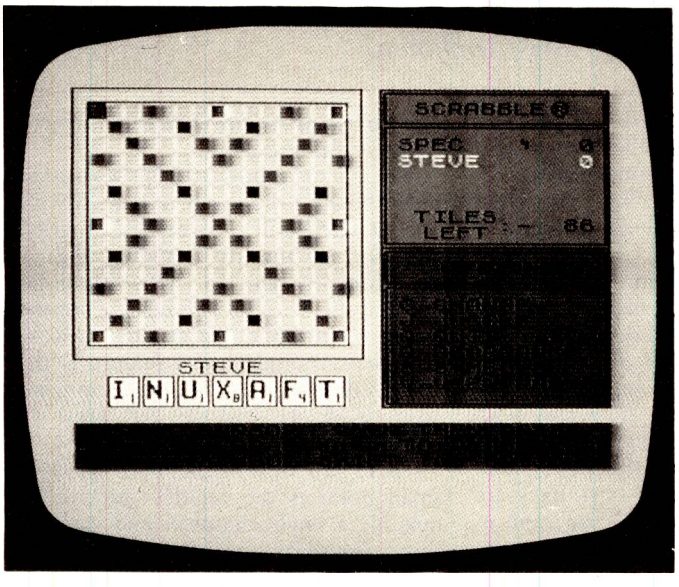


wipe out the first three bugs, the screen clears and a new set appears. This time they're magenta and move even faster. I presume that as the game progresses the bugs get more numerous and move at greater speed—I failed to progress further than the fourth grid, which gives five blue bugs moving at a great rate of knots. A joystick is really necessary to get the most from this game: responsive though the Beeb keyboard is, it's not designed to react fast enough to deal with games of this speed.

Bug Bomb is written by 16-year-old Simon Birrell, who says that he wants to be 'incredibly rich and famous'. Bug Bomb may not bring him fame but it certainly should make him some money.

It proves that computer games do not need to be incredibly complex to be entertaining. This is a very simple idea, but the smooth flicker-free graphics and speed of response make it challenging and a lot of fun.

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



Computer: 48k Spectrum
Supplier: Psion
Price: £14.95

A year or two ago, this would have been regarded as impossible—a cheap home computer playing that most addictive of all board games, Scrabble. It's still somewhat unbelievable, but with this program from Psion (under licence from Little Genius) your Spectrum will become a more than fair Scrabble player with a vocabulary of over 11,000 words (which is considerably more than many humans possess).

A few months back Maggie Burton gave a glowing review of the Apple version of Scrabble and she tells that the Spectrum implementation is even better. I found it totally gripping—I spent one very enjoyable all-night session locked in battle with the Spectrum—and I guarantee it'll give you a good hard game.

The board is displayed on the left-hand side of the screen with the score and player options on the right and the player's tiles at bottom centre. Rules are standard Scrabble—up to four players can take part, with the computer taking the place of any or all of them. Indeed, it's very amusing to watch the computer playing itself, especially when you choose the option of seeing the Spectrum trying out all its choices, with tiles being shifted around the board at great speed.

After loading you are asked a series of questions to determine whether your TV is colour or black and white, the number of players involved, whether you want the Spectrum to take part or simply keep track of the scores and dole out new letters, whether you wish to see the computer trying out all its possible moves or not and the chance to see what letters the computer holds. There is also the option to load a partially completed game. The program then randomly decides who is to play first, draws the board and loads the letter racks with tiles.

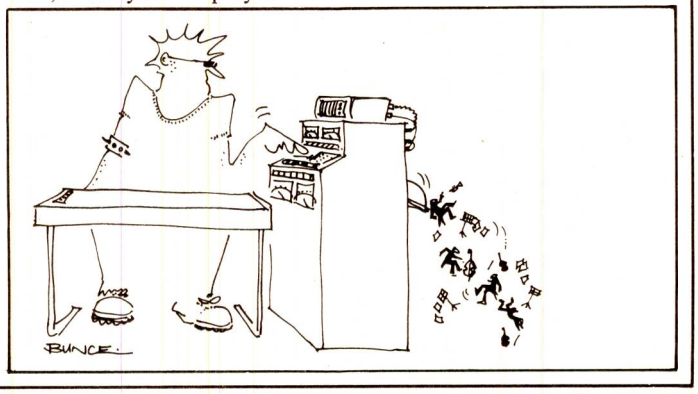
Options are selected by pressing Symbol Shift and the first letter of the relevant choice. These are as follows:
V view racks—displays all players' letters;
S symbols—gives the colour codes of the various premium value squares;
R rearrange—enables you to put your letters in any order;
J juggle—random rearrangement of your letters: very helpful if you're stuck while trying to think of a word;
C change—gives you the chance to throw away any letters that you don't like and draw new ones (you miss a turn with this option);
P pass—if you can't place any letters you miss a turn; and
Q quit—game can be saved and reloaded.

To indicate to the computer where you want your word placed you simply move the cursor with the arrow keys to the square desired and press 'A' for a word running across the board or 'D' for a down word; now key in each letter in turn and press 'Enter' to indicate completion. The Spectrum then gives a score for that word and asks if you want to place it there. Typing 'N' gives you the chance to try another position or another arrangement of letters, so you don't have to calculate your best possible move—you just try every possibility and let the computer do the maths for you. If you enter 'Y' and the word you chose is in the Spectrum's vocabulary, 'Word is accepted' comes up and your score is incremented and new tiles allocated. If the word is not known to the computer you are asked 'Are you sure?'—type 'Y' and the word is accepted. Of course this means that you can force the Spectrum to accept gibberish—it's a very trusting machine—but you wouldn't do that, would you? To play a blank tile, press 'Space' followed by the letter you wish it to represent. When displayed on the board the blank is given the letter you want but it is displayed in inverse video to indicate that it has no scoring value.

The computer will not let you use letters that aren't on your rack, nor will it accept words that are placed on the wrong part of the board. At the end of the game the program will reduce each player's score by the sum of his/her unplayed letters and if one player has used all his/her tiles that score is increased by the sum of the unplayed letters of all other players. The game can be halted at any time and saved for later reloading. The cassette comes in a 'library case' box which contains a booklet of rules for the game in general and instructions for playing the computer version.

This game very nearly achieved the first-ever 100 per cent rating. The only real fault I could find was the fact that it is impossible to challenge the Spectrum's words—and some of its two-letter efforts are very dubious indeed. Congratulations are due to Little Genius for the original computer Scrabble, to Peter Turcan, whose analysis of the game formed the basis of the program, and to Psion. Great stuff!

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



FINAL EDITION
WORD PROCESSOR TYPES

Word processing is not always synonymous with text editing made simple. With such an abundance of packages available the lay person needs all the help he can get. We asked Roy Thornton to try out View and Richard Simmons SCRED to determine their user-friendliness.

SCRED is a combined word processor and basic text editor for the BBC computer. Loaded from cassette it occupies about 10k of memory. Tape files created by SCRED may not exceed 408 lines and disk files 331 lines, owing to memory requirements. For the same reason, SCRED uses Mode 7 (25 lines, 40 cols) for screen display and any Basic programs run with it in memory must be tailored not to overwrite it. Loading SCRED from tape takes about two minutes. These and other limitations aside, this package is ingenious and delivers what it promises. Although tailored to the very popular EPSON printer, it can be used with others, whether parallel or serial.

Using SCRED

SCRED uses the full ten function keys and provides seventeen more functions based on the control key. After start up, a simple menu is shown, inviting either the editing of a file already in memory, the loading of a file from disk or tape, or the creation of a new file. A split screen is then displayed on which two lines are 'reserved' and the remaining 23 available for the user.

On the screen, as first displayed, each empty file line is ended by a 'paragraph' marker — a white block. As these are overtyped the end of the paragraph is transferred to the next white block, and so on. When the paragraph is finished, its end is therefore marked by the non-overtyped block. Alternatively, the text can be typed continuously and paragraphs inserted later. You can easily type on ahead and faster than the text appears on the screen.

At the bottom of the screen, more space is called up by scrolling forwards. But any part of the text, beginning with the line where the cursor is located, can be scrolled to the top of the screen.

Function keys

The red function keys on the BBC micro provide commonly used facilities. Four handle scrolling backwards and forwards; three allow the insertion of blank lines, or the copying or the deletion of existing lines. Another allows a line, or block of lines, to be defined — for purposes to be explained later.

The most used will probably be function key 9. This permits the insertion of text (or spaces) at the point where the cursor is located. It also changes the operation of the delete key (which normally deletes at the cursor position and backwards) so that text forwarded from it is deleted — a highly useful facility.

The insert feature illustrates the central working of SCRED. One line or any number of lines are treated as 'paragraphs', depending on the position of the marker. The insertion of new text into the middle of a paragraph does not push existing text off the line into oblivion, but onto the next line of the paragraph, and so on. During this process, extra lines are inserted at the end of the paragraph as necessary. Preceding and succeeding paragraphs are not affected.

Some users may wish to retain the appearance on the screen of subsequent lines in the current paragraph. This can be achieved by other methods of insertion. Also any defined block of text can be moved or copied to any place in the file.

Commands

These (see Fig 2) and other operations are carried out directly from within the file. But the second reserved line of the file, accessed by using the escape key, is a command line. (The first line contains a counter showing how many lines are in the file, the number of the cursor line, the name and the type of the file). Fifteen commands are available, including one to pass commands directly to the machine operating system.

Among these is a text search command to position the cursor on the first character of the search string. A string of up to 35 characters can be searched for though the file. Global substitution works with any old plus new string not exceeding 32 characters in length. So 'PERSONAL COMPUTER WORLD' could be replaced by 'BUY IT' but not by 'Buy IT now'.

Good and bad points

When a new file is set up, it is created as a text file. Basic files are declared by a command which puts the cursor at column six, leaving the first five columns for line numbers.

Function keys can be reset for Basic programming using the Put or Escape commands. Key 1 then becomes List, key 2 Run, and so on. SCRED also has a range of useful error messages.

The manual claims, and this worked for me although I did not test it extensively, that SCRED will recover bad programs and correct the file handling bus in Operating System 0.1. This establishes SCRED as a useful product, a position which is consolidated by the printing features. Another useful feature is that after defining a block of lines, commands such as delete, change and print are restricted to that block.

There are drawbacks to SCRED. A small point is the relative difficulty of deleting a single character and leaving a space, or inserting a single space. This is a frequent requirement but with SCRED — outside insert mode — cannot be achieved by a single key. Nor can page lengths be set with overlap. Typing ahead to the bottom of the screen can make scrolling difficult to achieve immediately. After scrolling the cursor does not automatically locate at line one, column one on the screen.

Main SCRED commands

Declare a Basic/text file
Scroll forward/backwards/to top/bottom of file
Shift line/paragraph one space to left/right
Move cursor line to top of screen
Move cursor five spaces right
Insert line preceding cursor
Make cursor line blank
Insert eight lines
Erase line/paragraph from cursor
Split paragraph in two
Join two paragraphs
Shift line/paragraph +/− 39 spaces (ie, to left or right)
Delete cursor line
Insert/copy/delete line
Insert characters, spaces, into line/paragraph
Search for text string
Substitute new for old text
Define/undefine block of text
Move/copy/delete/print, etc. block of text
Name file
Number/renumber lines of file
Append file to current file
Put Basic file into memory
Get Basic file from memory
Save file onto tape/disk
Print file in specified format

Fig 2

Memory limitations, and its modest price, probably explain the absence of certain features. Obviously a chip-based package doesn't occupy otherwise useful space in RAM. Some would-be purchasers may find a compelling argument for buying a more sophisticated package in the fact that SCRED cannot display formatted output on the screen prior to printing. Most heavy word-processor users will have an 80-column screen and want to see what their work will look like on the page before printing. Nor does SCRED have word counting facilities.

By combining a word processor and a Basic handler, Stable Software sacrificed desirable features in each to the memory demands of the other.

Printing

SCRED looks good value again when you examine its printer capabilities. In the first instance, these are set internally to specific defaults: Epson printer, 66 lines per page, 60 characters per line, fanfold paper. These settings may be changed with the addition of appropriate control codes. Single sheets can also be handled.

There is also a facility for inserting control codes by overtyping two characters (CHR$92, CHR$124) in the file. Most of these codes take effect only on the screen but nine have different meanings for the screen and the printer. (Flashing text on the screen is emphasised text on the Epson, etc.)

SCRED also provides five printer-independent control codes for page width, indenting, setting formatted or unformatted output, and beginning a new line.

For printers other than Epson, some adjustments to memory must be made. These may well baffle the less experienced user or the simple author who wants painless printing. Unfortunately, the generally excellent manual here lapses from clarity and will be too opaque for many readers.

But assuming the suppliers will supply instructions for non-Epson printers, the whole control/code printing facility must be considered highly valuable. At £18 for the tape version and £21 on disk, SCRED has a lot to offer for a modest price. It is available from Stable Software in Winchester, tel (0962) 712530.

VIEW

View is the Acornsoft word processor for the BBC micro. It comes with a 16k ROM with introductory booklet, ring-bound guide and prompt card at a price of £59.80 and can be used with disk or cassette. A printer driver at £9.95 is likely to be an essential. The ROM should be fitted by an Acorn agent who can ensure that the system is fully compatible.

The potential technical difficulties are that O.S. 1.2 is needed together with a printer driver, which is difficult to implement without Basic 2. Acorn will replace O.S. 0.1 with 1.2 (free if requested with order).

The minimum system of cassette recorder, b & w television, Model B (or Model A with upgrades) and matrix printer will work but the quality of the View package lends itself to disk, monitor, daisy-wheel for final output and, possibly, matrix printer for fast sample (if it uses the other printer connector). Single sheets or continuous feed paper can be used.

On a colour monitor the text can be displayed in any of the usual BBC colours against a preferred background. In normal, simple operation the cursor movement may seem slow. The commands to change the speed and set colours are not shown in the View guide. (See colour reference table below for the details.)

Colour reference table

While in the command mode the background and text colours can be set by holding down the control key and typing the sequence of symbols shown in the columns for Text and Background; the colours will need to be reset on change of mode.

Mode	Display Size	Colour	Text	Background
0	32 rows of 80	Black	SA@@@@	S@@@@@
or		Red	SAA@@@	S@A@@@
3	25 rows of 80	Green	SAB@@@	S@B@@@
or		Yellow	SAC@@@	S@C@@@
4	32 rows of 40	Blue	SAD@@@	S@D@@@
or		Magenta	SAE@@@	S@E@@@
6	25 rows of 40	Cyan	SAF@@@	S@F@@@
		White	SAG@@@	S@G@@@
	32 rows of 40	Black	SC@@@@	S@@@@@
		Red	SCA@@@	S@A@@@
or		Green	SCB@@@	S@B@@@
		Yellow	SCC@@@	S@C@@@
5	32 rows of 20	Blue	SCD@@@	S@D@@@
		Magenta	SCE@@@	S@E@@@
		Cyan	SCF@@@	S@F@@@
		White	SCG@@@	S@G@@@
	32 rows of 20	Black	SG@@@@	S@@@@@
		Red	SGA@@@	S@A@@@
		Green	SGB@@@	S@B@@@
		Yellow	SGC@@@	S@C@@@
		Blue	SGD@@@	S@D@@@
		Magenta	SGE@@@	S@E@@@
		Cyan	SGF@@@	S@F@@@
		White	SGG@@@	S@G@@@

The View ROM does not prevent the computer being used in its normal state. You use the *BASIC command to switch out of word processing and *WORD to return. A particularly nice feature is that when you press Break, the computer remains in its current state, either program or word processing.

First impressions

Many a BBC must have been sold with the idea that it would be useful for more than games and here is a product which may justify that hope. View makes full use of the various BBC modes to display text in rows of 20, 40 or 80 characters. The text can be formatted later to the row length required for the printer.

Bearing in mind that you will probably require a disk system if you are thinking of getting a word processor, then you are not limited in choice to Acornsoft products. Other word processors are available now at a lower price and might well do for the less sophisticated user. View is a quality product, but the essentially computer-biased instructions will seem unfamiliar to the dedicated word processor. Also the BBC keyboard will appear very clattery though not unpleasant to the touch.

The BBC function keys store 29 commands: the commonest ten directly, ten shifted and nine in conjunction with the control key. The prompt card, which can be slipped under the transparent plastic strip, shows these commands quite clearly.

The cursor can be moved around the screen by use of the four arrow keys. If shift is pressed at the same time then the cursor moves left or right by complete words, and up or down by a screen worth of display.

Tabulation positions and the number of characters per line (up to 132) can be set quite easily using 'rulers' which display margins, tab positions and beep positions. If you have more characters per line than the screen mode allows then only a 'panel' of the page is shown. When you come to the edge of the panel the screen automatically displays an overlapping panel with the cursor in the middle so that you may see the region around your present typing position. You can define up to 128 of your own rulers, and set them up wherever you require a new shape to your text.

Markers 1 and 6 can be positioned anywhere in text. Markers 1 and 2 have special effect when moving blocks around and they are the only markers that are visible.

Commands

The immediate commands available include:

Format text as it is entered

FINAL EDITION

Go to top of text
Go to beginning of line
Set marker
Insert line
Split line
Delete character
Delete up to end of line
Format a block of text
Enter further edit commands
Insert text as it is entered
Release margins
Use highlight 1 (underlining ?)
Use highlight 2 (bold type?)
Justify text as it is entered
Go to bottom of text
Go to end of line
Go to marker
Delete line
Concatenate lines
Insert character
Delete up to a given character
Move a block of text
Delete an edit command
Delete block of text
Move to next match

Some commands may be implemented by use of the Enter Edit command and a two letter code followed by numbers in some cases. These 'stored' commands include the following:

Centre the line of text
Set page length
Line feed on to next page
Set top margin
Set bottom margin
Define headers
Turn off headers
Print two sided headers
Unprinted comments
Right justify
Set line spacing between blocks
Set left margin
Set header margin
Set footer margin
Define footers
Turn off footers
Print only odd (even) pages

Other instructions are available in command mode. This mode is entered by pressing the escape key (no text is lost and the escape key can be pressed again to revert to the text). These commands include Change, Search, Replace, Read, Write, Edit, Count, Clear, Printer, Print, Screen, Load and Save. (Slightly annoyingly, text must be saved before it can be printed but this may avoid accidental loss of valuable documents.)

— Change this that
will cause every 'this' to be changed to 'that'
— Search anything
will find the word 'anything' and show a portion of text with cursor under the a of anything. You can then choose to amend the word or move on to the next occurrence of 'anything' by using the Next Match facility on the function keys. A Wild search facility included in which ? is used to replace one or more of the letters. For example Search any????? will find anywhere as well as anything. By setting markers the search can be restricted to only part of the text.
— Replace some few
will find each occurrence of 'some' and allow you the option of replacing with 'few' if you press Y or leaving the 'some' if you press N.
— Count 1 2
will count the number of words between marker 1 and marker 2 (taking a word as anything within spaces or space and end of line).
— Screen
does a screen display of the output.
— Save this
will save the text file under the title 'This'.

Good points

The commands listed above show the power of View, but for the dedicated user the best is yet to come.

Firstly, 26 number registers are available, labelled A to Z, of which two, P and L count pages and lines. These registers can add or subtract with integer, decimals or register values but will only give an integer result. These register values can be printed in headers or footers to a page but unfortunately not elsewhere.

Secondly, there is a powerful 'macro' feature, in which blocks of text or series of commands can be stored for use anywhere, except within another macro, and used as required. Within any macro up to ten areas can be marked with @0,@1 . . . up to @9 and then these areas can be filled with values that are declared when the macro is required; see Fig 1.

Conclusions

View costs £59.80 and is available from Acornsoft, tel Cambridge (0223) 316039. An excellent and relatively easy word processor to use, View has sufficiently powerful facilities to make it attractive to the small business and education market. The version I used, however, did have several inbuilt bugs. For example, Delete To End Of Line inserted up to 132 spaces — uselessly occupying valuable memory. Spaces were essential after most of the command mode keywords. Justification was incorrect when tab characters appear

GOTO page 205

View	Appearance		Explanation
DM	AA	:	Define macro with the reference AA
RJ	Micro In Commerce Emporium	:	Right justified own address
RJ	1 Wontmakethe Road		
RJ	QUICKBUCK		
RJ	QU1 OLP		
RJ	@0	:	Space for date labelled @0
	@1	:	First line of letter address @1
	@2	:	Second line
	@3	:	Third line
	@4	:	Postcode
CE	Reference, @5	:	Centred title or ref no
	Dear @6,	:	Space for name

Please find enclosed the @7 you requested in your letter of the @8.

If we can be of any further assistance do not hesitate to contact us again.

CE	Yours sincerely,	:	Centred
CE	@9	:	Centred name
PE		:	Eject Page (Line feed to end)
EM		:	End of Macro

This macro could then be used by calling its reference and supplying the details for the ten spaces, as shown below.

AA 1 June 1983, Mr I Haff, Dunnett Avenue, Tride, Suffolk, TR1 0NN, Mice Computers, Alan, catalogue, 28 April, V L Sics

producing

Micro In Commerce Emporium
1 Wontmakethe Road
QUICKBUCK
QU1 OLP
1 June 1983

Mr I Haff
Dunnett Avenue
Tride
Suffolk
TR1 ONN

Reference Mice Computers

Dear Alan,

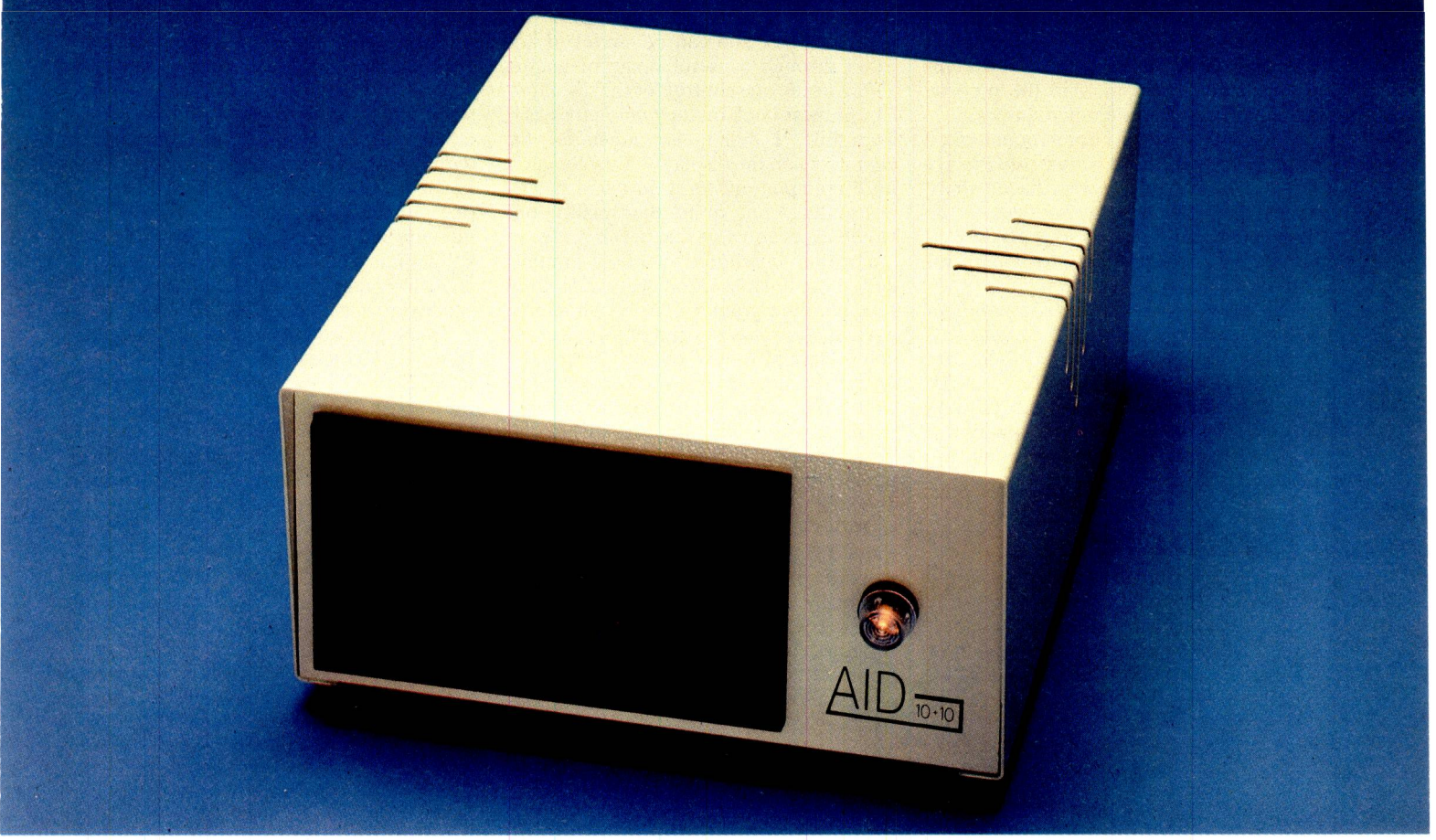
Please find enclosed the catalogue you requested in your letter of the 28 April.

If we can be of any further assistance do not hesitate to contact us again.

Yours sincerely,
V L Sics

Fig 1

A PERFORMANCE AND PRICE BREAKTHROUGH IN APPLE][® & //e HARD DISC STORAGE



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BENCHTEST

'A multi-user, low-cost minicomputer at microcomputer prices?' Peter Rodwell seizes the long-awaited opportunity to scrutinise the Fortune 32:16.

Something like a year ago, I was invited to a posh London hotel for a sneak preview of the latest in 16-bit microcomputer technology, the Fortune 32:16. I had already heard much about this machine for it had caused a sensation a few months previously when it was unveiled in America: it was based on the Motorola 68000, which at that time had been tamed by very few companies, and it offered, said the reports, minicomputer power at micro prices.

The quick demo in a hotel room looked impressive and I have been itching to get my hands on one every since: there appeared to be a few rough edges on the demo machine but the concepts looked interesting and it promised to give microcomputing a major nudge forward.

Having now seen the machine and spent a considerable amount of time with it, I must say straight away that I'm not so sure. I'm not sure whether what it offers could be called a major nudge forward and, frankly, for reasons which will become apparent, I can't even decide whether or not I like the machine. . .

Hardware

Styling is a matter of personal taste and although I think the Fortune is a rather stylish machine, others I know thought it rather ugly. The machine comes in a now standard 'three-box' configuration — separate screen, keyboard and main box containing the disk drives and electronics. The main box features a horizontal ribbing arrangement across the front and it comes in two-tone beige.

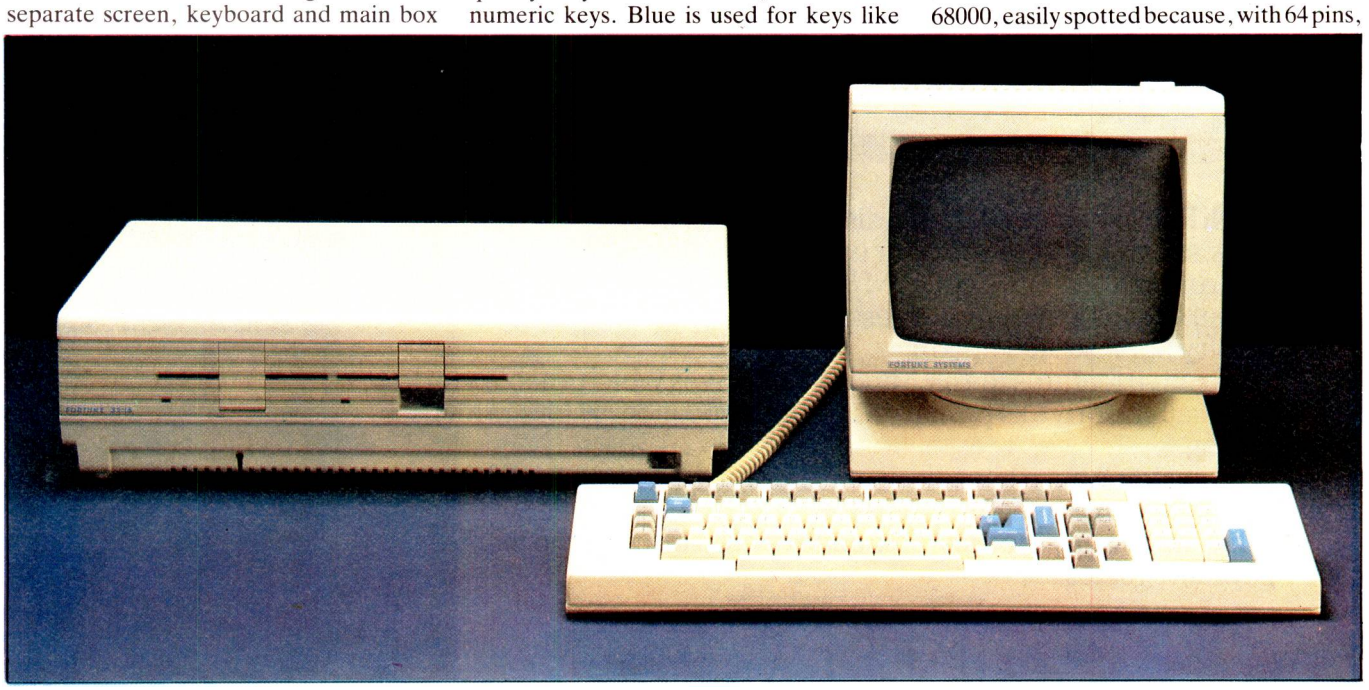
The display gives a standard 24 lines of 80 characters in green on a black background. It sits happily on top of the processor box and can be swivelled and tilted through a useful range of angles. There's only one control for the display — a brightness knob on top, where it's easily accessible. I didn't care much for the characters on the display — they looked a little cramped and only just had proper descenders, not quite the quality one would expect on a system of this price.

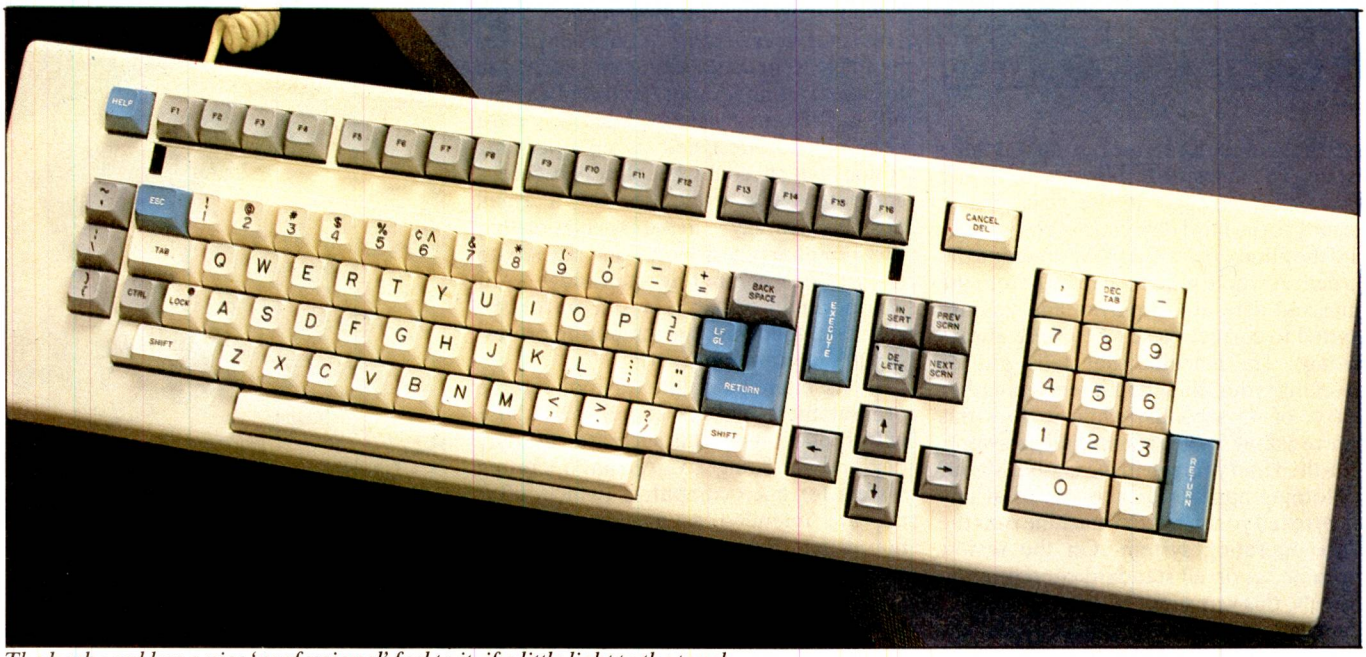
Fortune brochures mention graphics and colour but these aren't yet available. A monochrome graphics display should be available towards the end of this year and colour should follow on early next year. One of the nice things about Fortune is that as a matter of policy it releases all new products worldwide simultaneously — it's very annoying with some American companies to see all sorts of new goodies appearing only in the States, with us poor relations having to wait for months before they cross the Atlantic. This policy applies to both software and hardware developments, by the way.

The keyboard has 99 keys, all colour coded according to function. The main qwerty keys are in white, as are the numeric keys. Blue is used for keys like ESCape and RETURN and also for the HELP key, which sits at the top left-hand edge of the keyboard. Grey is used for cursor control and editing, and also for a column of three keys at the left which provide symbols such as '{' and '}', very handy for all the C programmers likely to be using the machine. There's a gap between the row of function keys and the top of the qwerty area in which a plastic strip can be inserted with function key labels and indeed these strips are provided with Fortune's applications packages. The keyboard features two RETURN keys, one with the qwerty block and one with the numeric pad plus an EXECUTE key which will initiate a command or menu selection and which generally — but not always — is synonymous with the RETURN key.

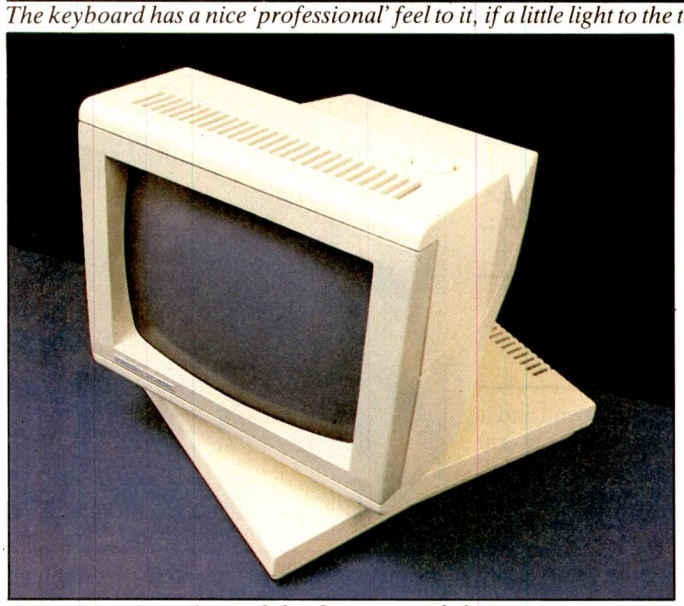
The keyboard has a nice 'professional' feel to it, if a little light to the touch for my taste. All the keys auto repeat if held down for a second or so and this is a two-speed affair: after a couple of dozen or so repeats, the repeat rate speeds up dramatically, which is handy for moving the cursor around quickly in text.

The main box houses all the electronics and the disk drives. An inside look revealed a massive main PCB buried under the disk drives and housing the main electronics: processor, some RAM, boot-up and diagnostics ROM and the floppy disk controller. The CPU is the Motorola 68000, easily spotted because, with 64 pins,

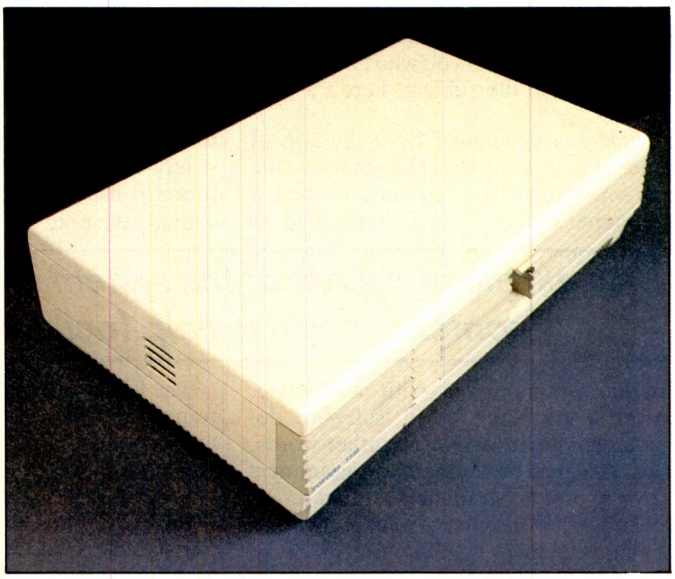




The keyboard has a nice 'professional' feel to it, if a little light to the touch



The screen tilts and swivels but has cramped characters



The main box houses all the electronics and the disk drives

it's so big. Although an 8 MHz chip, it's actually clocked at 6 MHz; apparently, because the system is so dependent on the hard disk's data transfer speed, running the CPU in top gear wouldn't actually produce any significant increase in throughput. A faster (in terms of data transfer) hard disk is on the way, though.

The main PCB houses 256 kbytes of RAM, which is what you get with the standard system. A line of four slots towards the rear of the cabinet allows you to plug in extra RAM and in fact the review machine came with ¾ Mbyte slotted in. Each memory expansion board holds 256k, although a 'top-up' board is also available with just 128k on it. As the top-up board costs nearly one-eighth the price of the 256k expansion board, it might at first sight seem worthwhile fitting two of these instead of the 256k board if you don't want the full 1 Mbyte of RAM possible with the machine. Fortune thought of this, though: you can only add the top-up board when you have three 256k boards installed! These boards use 64k RAM chips, of course; interestingly, when 256k RAM chips become available, total memory capacity will be increased to 4 Mbytes as the chips are totally interchangeable.

The review machine came with a 5 Mbyte winchester disk and an 800k floppy. Optionally, a 10 or 20 Mbyte hard disk can be fitted and Fortune also makes a system with two floppies, although with the heavy amount of disk accessing which takes place this would certainly be a painfully slow machine to use and not really a practical proposition in a single-user environment, let alone a multi-user system.

Over on the right hand side of the cabinet are a row of slots for other expansion boards. Two of these were occupied on the review machine, with a hard disk controller and a character generator board. Other options which can be slotted in are a parallel I/O board (the machine comes with only one RS232 port in the way of I/O) and a four-port serial board to drive extra terminals in a multi-user set-up. The bus used is Fortune's own and details are not being released to other manufacturers at the moment, although I'd expect this to change eventually if the machine catches on in a big way — look what's happened with Apple and IBM add-ons.

The minimum useful configuration would be one with the basic 256k of RAM, a 5 Mbyte hard disk and a floppy and this, with a single-user operating system and word processing software, would cost you all of £6000, which makes it a very expensive system indeed if you just want a single-user system, but a reasonable basis for a multi-user configuration — compared to minicomputer prices, it's laughably cheap, of course.

'This is quite definitely not a machine for the corner newsagent . . .'

Systems software

Powering up the 32:16 is a rather lengthy process. Of course it only takes a second to reach round and flick the 'on' switch at the back of the machine but then there's a

FORTUNE 32:16

lengthy wait before you can do anything useful. The machine displays its name and the cryptic message 'Please wait', which flashes as the hard disk churns away busily and the numbers 1 to 9 appear slowly on the screen. A whole minute elapses before the time and date are displayed and you are invited to correct these (they were always wrong). The machine then tells you it's checking your files and there's another delay, of 45 seconds, while it does this before asking for your name and password. You then find yourself in the Global Menu.

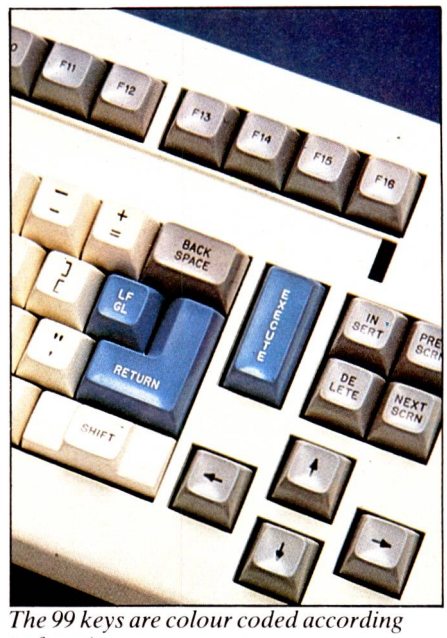
Nothing appears on the screen at any stage to tell you so but the machine runs the Unix operating system. On the review machine, as on all standard configuration models, this was supplied for a single-user environment, but an upgrade package converts this for multi-user use. Now regular *PCW* readers will have gathered by now that Unix is not exactly a big favourite of mine. For those of you who have missed my ravings on the subject, here's a brief resume:

Unix was developed by a division of America's gigantic Bell Corporation, the very same one which runs most of the US telephone system. It was developed to provide programmers with a flexible, powerful and easy-to-use 'software development environment'. In other words, it was designed by computer programmers for computer programmers and therefore a number of assumptions were made in its design, principally that the user would be very familiar not only with computers generally but with a number of computing concepts which are far from obvious to the layman.

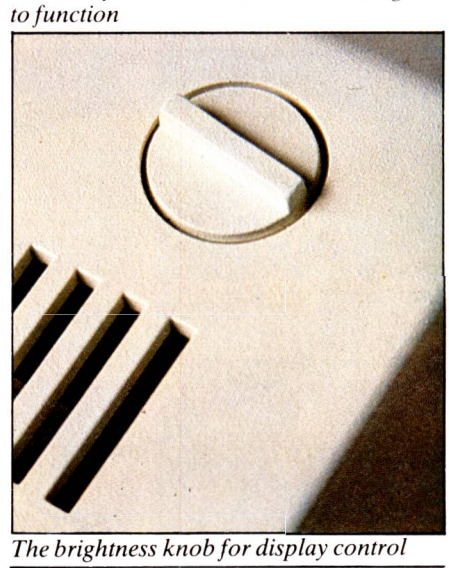
It was further assumed that should a user be unfamiliar with any of the concepts required to use the system, he or she would happily spend time learning them and that error messages or other remarks displayed by the system could safely be couched in technical terms without the risk of anyone not understanding them. Unix was most certainly not designed as an operating system which could be placed before a computer-naive end user — a small businessman, say — in the expectation that he would happily sit down and use it with no previous computing knowledge — it was never intended as a system for the general public but as a computing professional's operating system.

In its intended role as a tool for the programmer, Unix is superb and those who support its use as such are certainly justified in doing so. As an operating system for microcomputers (which, after all, are intended as machines for the non-expert, the total computer layperson, to use with minimal computing knowledge and instruction) it is awful in the extreme and anyone who builds a Unix-based microcomputer and markets it in that form, expecting the public to snap it up, has got a nasty shock coming.

Fortunately, Unix has a redeeming feature: it's possible to shield the user from its horrors by adding a friendly 'front end' to it and this is exactly what Fortune has wisely done with the 32:16; other manufacturers considering Unix for their micros should take note.



The 99 keys are colour coded according to function


The brightness knob for display control

'An excellent aspect of the system is its on-line, context-sensitive help facility . . .'

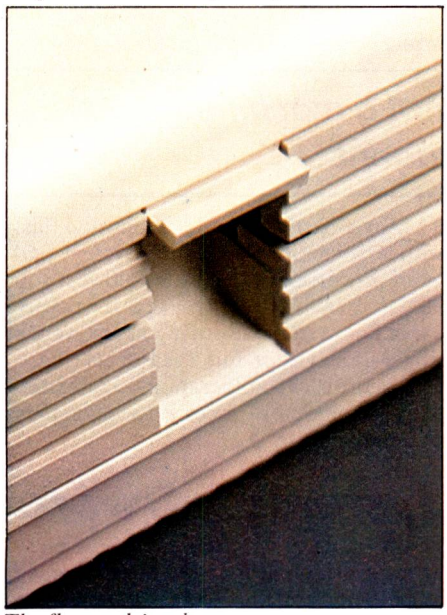
The Global Menu is this front end and it transforms the Fortune into a useful microcomputer for the layperson by removing him or her from any contact with Unix at all, although the option to dive into Unix itself is there for programmers and purists to tackle if they so wish (you simply type 'unix' from the global menu and in you go; Control-D returns you to the menu).

One very excellent aspect of the system is its on-line, context-sensitive 'help' facility. It's there right on the keyboard in the form of a key labelled 'Help' and pressing it at any stage usually produces a screenful of explanation as to what you're supposed to be doing. This is very good indeed and something which all computer manufacturers should emulate, although I suppose it's only really practical, at least to the extent to which it is implemented on the Fortune, with a hard disk-based system. There were, however, a few niches in the system for which there were no 'help' facilities and a brief message to this effect would appear instead.

Fortune has gone further than this by providing an operator training selection on the menu, which is a very good idea indeed and provides a useful introduction to the system.

Selecting an item from the menu is simplicity itself. You can either just type the letter and number next to the item required or move the cursor to it; in either case, the choice is activated by typing RETURN. Quite a large selection of items were present on the menu but most were not implemented on the review machine; the active ones are printed in brighter-than-normal characters and the inactive ones in ordinary type; trying to select an item which had not been installed gave an error message to this effect.

As well as providing access to whatever applications programs and languages have been installed on the system, the global menu also includes various system utilities. A lot of these are concerned with directory manipulations of various sorts. Unix has a hierarchical directory structure but fortunately there's no need for the user to get caught up in its intricacies for a lot of this can take place quite transparently. Certain operations, especially moving from one directory to another or copying files from one directory to another do, however, require that the user maintains a good mental image of the system; my feeling is that this is too complicated for the end user to get to grips with (remember, we're talking about a machine being sold in a market which is supposed to be catering for the computer-naive) but to judge from the pathetic hate-mail I get whenever I dare to criticise Unix, this is an aspect not widely appreciated by Unix proponents. On the other hand, when we're talking about systems with integral 10 Mbyte hard disks, *something* is needed to make it easier to find out what's on the disk and until


The floppy drive door

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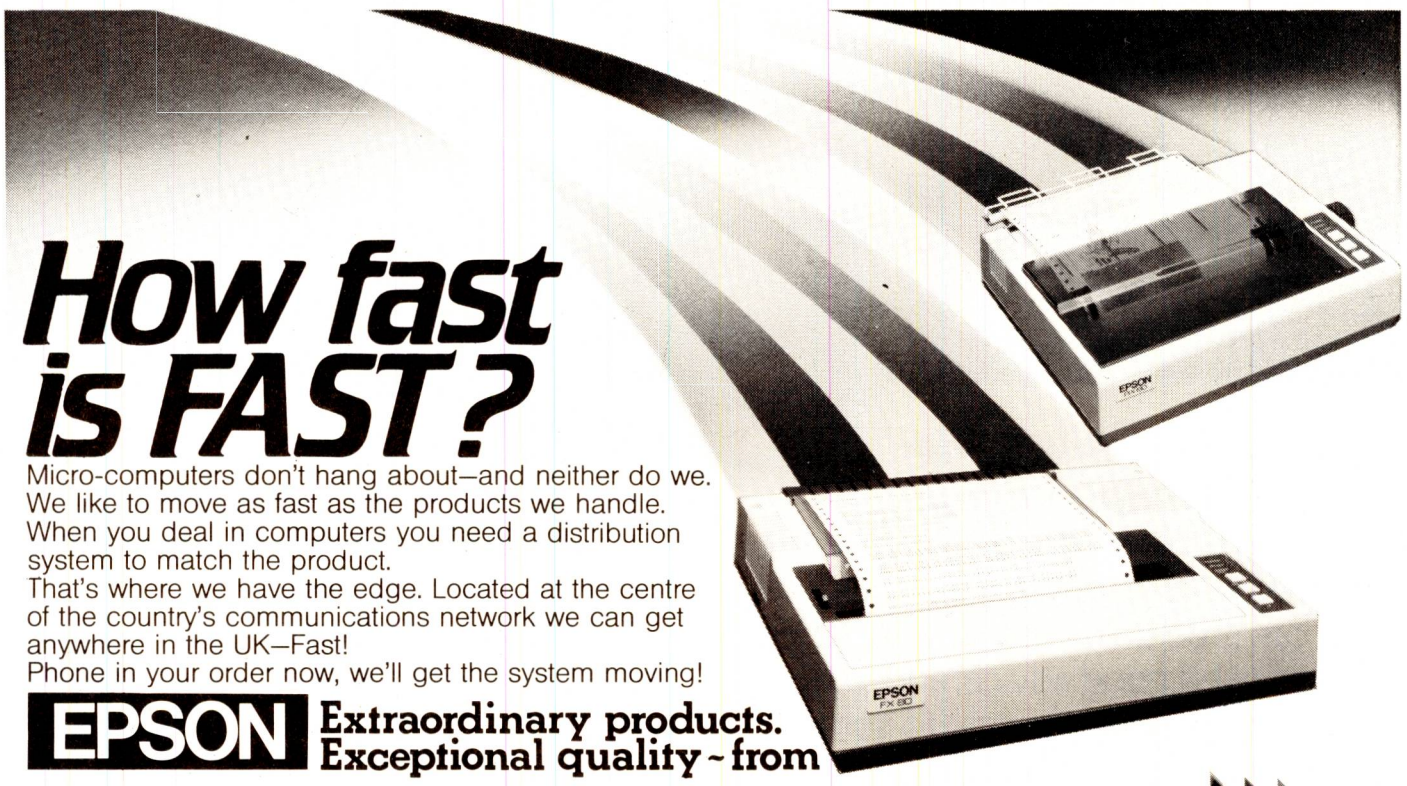

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something better comes along we'll have to make do with roots and subdirectories and pathnames, a rather unsatisfactory situation. Curiously, nowhere in the documentation or in the 'help' pages could I find a way to see what was on a floppy disk; Fortune's attitude to floppies seems to be to regard them exclusively as a means of loading in software to the hard disk and backing up files from the winchester. In fact you need to dive into Unix to find out what's on the floppy, which is rather unsatisfactory — you can't rely on people infallibly keeping disk labels up to date.

There is a special utility for loading a Fortune package from floppy disk onto the hard disk and incorporating it into the global menu. But as far as I could establish, this is *only* for use with software supplied by Fortune. I wrote a short C program and, having successfully compiled and tested it, tried to get it onto the menu, to no avail. The system seemed to require more than just the program on the floppy disk and I could find no information as to what was required. It turns out that again you need to get into Unix to do this, where there's a special utility for this purpose; this won't bother most end users, of course, and is something which any competent programmer should have no trouble with.

Switching on the Fortune is not the only lengthy process; switching off also requires patience, for instead of simply reaching around the back and flicking the switch off, you're supposed to run a special program first. Naturally, I only discovered this in the manual after I'd switched the machine off several dozen times using the on/off switch but no damage seemed to result. What the power-down program does, of course, is to make sure any open files are closed neatly rather than left hanging open, with attendant dangers of corruption. This is all very well on a minicomputer with several users bashing away — you really can't just chop off the power when you feel like it without giving everyone the chance to save their work and close their files. It's a bit silly on a single-user microcomputer but Fortune sees most of its sales being of multi-user systems so it makes sense. But I can't help feeling that, although it's nice to have a system check for possible file corruption before powering down, this is really something which could and should be done automatically.

Space doesn't allow me to go into the fully gory details of this Unix implementation — it seems very standard and any Unix programmer should feel perfectly at home. An upgraded version is in the pipeline (pun) and should be available soon; it's said to offer a substantial increase in throughput speed as well as some extra facilities.

Languages

One choice on the global menu is headed simply 'Prog languages'. Only Basic and C were supplied on the test machine, with Fortran and Pascal on the languages menu but unimplemented. Cobol is planned and will be launched soon.

Like most other aspects of the system, Fortune Business Basic has a definite minicomputer air to it; in fact it reminded me strongly of the first Basic I ever came across, on a DEC 2020 system, and has a decidedly antique feel to it compared to most microcomputer Basics (yes, even Microsoft Basic!). For example, it will only accept keywords typed in upper case and it adds leading zeros to line numbers when you LIST a program. But these are relatively trivial points, for it's clearly a Basic designed for programmers rather than end users and is one of the most powerful Basics, in terms of the range of facilities and utilities provided, that I have come across.

One of its most valuable features is that program lines are 'compiled' as soon as they are entered. I put quotes around the word compiled as this is the term used in the manual, but I feel it's more a case of semi-compilation, like that used in Cromemco Basic. The advantage of this is of course that you get an instant error message when you make a syntax error; Fortune Basic displays a curt error message and reprints the offending line with a 'V' over the wrong part, which I think is an approach which should long ago have been incorporated into every Basic — it's far better than typing in your program and discovering all the syntax errors at RUN time.

'We are talking about a machine which will appeal chiefly to fairly large businesses . . .'

A further advantage of the semi-compilation approach is that programs should execute faster than those which are interpreted line by line at RUN time. I had expected spectacular things of this Basic, seeing as it combines semi-compilation with the very powerful 68000 processor — a new leader in our Benchmark summary table was indicated. In fact, as the Benchmark timings show, it turned out to be pretty average on the whole, with the added disappointment that I could not get Benchmark 8 to run at all. This includes the user of the LOG() function and although this is documented in the Basic manual, and although I entered it in exactly the format stated in the manual (and several others), the machine kept rejecting it with a syntax error message even though it happily accepted the SIN() which comes in the program's next line.

The Basic is, er, basically quite standard but has a large number of extensions and utilities; of particular interest is the provision for file locking and unlocking. This is important in a multi-user system — you don't want other people messing about in your files while you're using them so you can lock them out until you've finished updating it.

The 32:16 is the first machine we've Benchtested to come complete with a C compiler. It's not included in the price of the machine (and neither is the Basic or any other language) but as C is the language of Unix (Unix is nearly all written in C and C was originally developed on — but is by no means limited to — Unix systems) most programmers will want this option with their Fortunes.

The Fortune C compiler is a complete implementation of the languages as defined in the standard work on the subject, Kernighan and Ritchie's *The C Programming Language*. Its functions library contains much, much more than just the standard functions, however, and should prove a real boon to Fortunate programmers.

Time didn't allow me to investigate all of the functions available — or even a useful number of them — but I tried typing in a few C programs and immediately hit a silly snag. Fortune supplies an excellent word processor, For:Word (see below) and naturally I wanted to use this to type in my programs. Unfortunately (another pun) For:Word inserts characters which the C compiler rejects and it's necessary to use the Unix line editor instead. This is slightly better than CP/M's Ed, but only just, and I'm constantly amazed that such products are still offered — surely programmers deserve decent word processors, too.

Although the C compiler appears on the languages menu accessible from the global menu, you have to get into Unix itself to use it, which is no deterrent to a programmer, of course, and emphasises in a small way the difference between C and Basic (the latter being completely accessible from the global menu level) — C is a tool mainly for the professional programmer while Basic is more suitable for the occasional hacker as well.

We haven't yet managed to write a suite of C Benchmark programs (it's in hand) so I can't provide accurate comparisons. It's no surprise, though, that C programs executed very, very quickly on this machine. They were, after all, fully compiled and C makes optimum use of Unix as it was designed for this operating system in the first place.

Applications software

Two applications packages came with the review machine: the For:Word processor and Microsoft's Multiplan spreadsheet. As the latter has already been Benchtested in *PCW* I won't go too much into it other than to say that it seemed to run significantly faster than the Sirius version with which I am familiar, but this is only to be expected with that 68000 doing the hard work.

For:Word bears an uncanny resemblance to the Wang Writer software, generally reckoned to be one of the best dedicated word processors around. The resemblance isn't just software deep, either: the keyboard also has a Wang look to it . . .

To do it justice, For:Word will have to be

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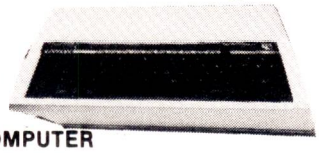

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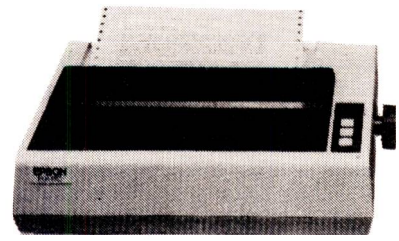

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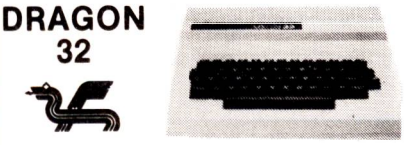

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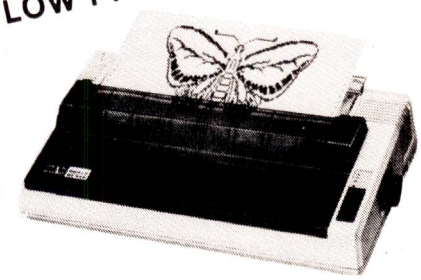

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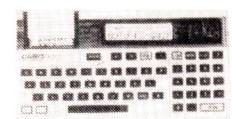

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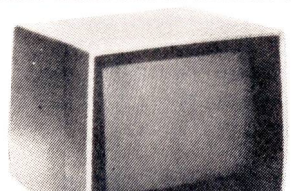

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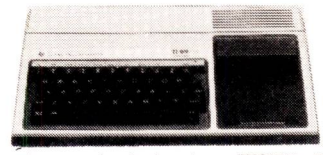

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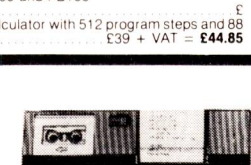

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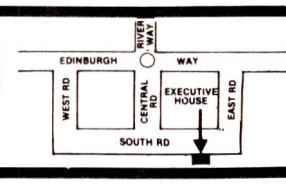


FORTUNE 32:16

subjected to a *PCW* Word Processor Benchtest in due course because it's a complex package although very easy to use. Again, the use of a plastic strip of function key labels makes it very easy to operate indeed and while it doesn't have some of the very esoteric functions offered by some microcomputer WP packages, it has everything (including a glossary function!) which normal commercial WP users could require. I am, in any case, beginning to feel that some micro WP packages are becoming *too* complex — although some users may need to be able to do anything conceivable to a piece of text, I think the bells and whistles available with some packages actually start to hinder the user with relatively simple WP needs — and that type of user makes up a very hefty proportion of WPers.

For:Word strikes a useful balance between simplicity of use and flexibility of functionality (did I really write that?). I mean that it provides a wide range of general WP functions without going over the top and giving you *everything*. This balance means you can sit right down and use it with only a glance at the manual and an occasional stab at the HELP key and do something useful, not a situation which applies to some of the bigger WP packages around. My only whinge from an admittedly less than comprehensive play with it concerns the display: extra symbols are inserted on the screen to show where you've hit RETURN or TAB and this makes your text look rather messy, but it's something I could learn to live with.

Other applications packages are planned, including a full accounting suite from Tetra (Fortune's US accounting software is of course useless in this country because of differing accountancy practices). And the forthcoming availability of Cobol means that a hefty amount of minicomputer software will be available very easily and quickly, which is good news for the corporate buyers who have minis already and want smaller machines on which they can use their existing software.

Documentation

Unlike too many other manufacturers, Fortune has taken a lot of trouble over its documentation. With the machine came a whole series of manuals, most of which were thick, A5 sized loose-leaf affairs with proper indices and illustrations even.

A manual comes with each applications package and language, although in the case of the C compiler the manual was A4 sized and not nearly as well presented as the others. A Unix programmer's manual was also supplied: it was A4 sized and 35mm thick and most definitely *not* for anyone unfamiliar with Unix!

The For:Word manual was clearly a preliminary version for too many pages contained simply a stark 'Text is being written and will be available soon'. It did however fulfil the basic requirements of documentation aimed at the end user: it was clear and concise, couched in non-technical terms without being patronising, explained *everything* in both tutorial and reference sections and made sensible use of diagrams and illustrations to make points absolutely clear, with the odd cartoon thrown in for good measure.

The Business Basic manual was more serious but no less useful and clearly aimed at a slightly different user, one familiar with computers and programming (there's no tutorial section) and, apart from the LOG mystery noted in the 'Languages' section above, seemed OK.

A thinner manual, called *Understanding Your Fortune System*, took me by surprise after the pleasant impression received from the other manuals. It's just as well-written, laid out and printed as the rest but it does really show up the 32:16 in its true light.

This manual is for the system manager, the person given responsibility for running and looking after the computer and is full of advice on keeping logbooks, installing products, adding new users to the system and making back-up copies of files and directories. I don't mean to imply any criticism here, it's just that at last we find out what the Fortune really is — it's a minicomputer, and this manual makes it clear that users had better get out of the sloppy habits adopted by us micro users and start treating the thing with the respect it deserves. But full marks to Fortune for the quality of its documentation — we need to see more like this in the mini, sorry, micro world.

Conclusions

When I first sat down with the machine, it was with the attitude that this was primarily a single-user microcomputer. What we have in fact is a multi-user, low-cost minicomputer at microcomputer prices. Fortune, too, regards it in this light, not only by supplying it with a minicomputer operating system but by supplying exclusively minicomputer software, a practice which it intends to continue.

We are therefore talking about a machine which will appeal chiefly to fairly large businesses, those which already have minis or mainframes and now want low-cost desk-top computing power as well but which aren't satisfied with conventional microcomputers.

Currently, the 32:16 will communicate with any Unix machine and the hardware and software to enable it to communicate with other types of mainframes and minis is on the way. Big computer users are used to thinking in terms of megabucks so while the Fortune is outrageously expensive in comparison to other single-user micros, it's bargain-basement stuff to these big users and should therefore appeal strongly. An office within a large company can be equipped with its own computer, to which several people can have access through their own terminals, and which can be linked into the company's main computing resources very easily and effectively, at remarkably little cost. This is quite definitely *not* a machine for the corner newsagent — it's not marketed as such, it's

GOTO page 206

Benchmark timings

BM1	2.4
BM2	5.8
BM3	10.5
BM4	9.6
BM5	13.4
BM6	25.7
BM7	37.6
BM8	(see text)

All timings in seconds. For an explanation of the Benchmark programs, see PCW Vol 5 No 11, November 1982.

Prices

Hardware

Single-user start-up system: 256k RAM, 5 Mbyte hard disk, 800 kbyte floppy, single user operating system and For:Word	£5,995
As above but with 10 Mbyte hard disk and *without* For:Word	£8,404
As above but with 20 Mbyte hard disk	£9,245
Multi-user operating system upgrade	£418
Comms board (required for multi-user system with three to five users)	£418
Work station (intelligent terminal for extra users)	£921
256k memory expansion board	£1,259
128k memory 'top-up' board	£165

Software

Business Basic	£247
Cobol compiler*	£669
Cobol run-time package*	£418
Fortran compiler	£418
Pascal compiler	£418
C compiler	£418
Idol database	£500
For:Word (included in basic system)	£418
Multiplan	£247

Business accountancy — various modules ranging from £275 to £544.

*Cobol available shortly

Technical specifications

CPU	Motorola 68000, 6 MHz
RAM	256k, expandable to 1 Mbyte
ROM	4k bootstrap
Display	24 lines of 80 characters, monochrome
Keyboard	99 keys including 16 function keys, full cursor control, numeric pad
Disks	5, 10 or 20 Mbyte winchester hard disk; 1 800 kbyte 5¼in floppy
I/O	1 RS232 serial port; additional serial and parallel ports optional
System software	Unix with user-friendly menu front end
Languages	Optional Basic, C, Pascal, Fortran, Cobol
Applications	Word processing, spreadsheet, database, business accounts.

BENCHTEST

SORD M5

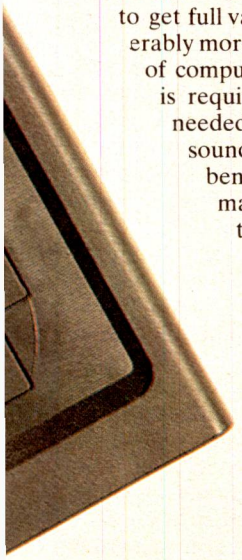
Sord's entry into the full-colour sub-£200 sector of the home computer market is something of an enigma. On the one hand, its user memory could charitably be described as meagre—but, to compensate, there's a full 16k of video RAM giving superb sprite graphics. Steve Mann puts the Japanese challenger through its paces.



Photography by Ian McKinnell

This review nearly turned out very differently. Micro magazines have recently been full of dire warnings of an impending Japanese invasion, but at first sight the vanguard of the invading forces, Sord's M5, appeared to indicate that there was nothing to worry about. A £190 computer with integer-only Basic and with just 3k or so of RAM available to the user — how could that possibly pose any sort of threat to the Spectrums and Orics we have come to know and love? I was all set to put the boot in. Reading through the introductory manual only confirmed my suspicions — it was full of mistakes and, among other howlers, contained absolutely no mention of how one was supposed to use the sound facilities, even though Sord proudly trumpeted 'three chords, one noise, seven special sounds' in the setting-up booklet.

So, pen dipped in vitriol, I was all set to put the upstart in its place. Then I was loaned a Basic-G cartridge to try out for a couple of days — and my opinion changed rapidly. With Basic-G in place, the M5 was a different machine. I had no time to give the extra facilities any more than a cursory examination, but it soon became clear that Sord has come up with a very neat and clever machine indeed. However, to get full value from the M5, considerably more than the basic package of computer and Basic-I cartridge is required: extra cartridges are needed to use the graphics and sound facilities and to reap the benefits of full floating-point mathematics. This is going to add considerably to the price and could be a major stumbling-block to wide acceptance. The Sord is not a cheap machine, even in its basic configuration, and for any serious application the user is going to have to fork out around £225.





'Joypad' games controllers

Hardware

The M5 comes in a Spectrum-style case measuring 262 x 185 x 36mm, and weighs in at 1kg. It is finished in two shades of grey, with yellow and white lettering, and has a 55-key touch-sensitive keyboard. At the rear are sockets for cassette, printer, two 'joypad' games controllers and output for a standard TV or composite video. In addition, there's a lift-up lid which allows access to a socket for the various plug-in cartridges. The whole thing is manufactured to a high standard and seems satisfyingly robust.

Sord obviously does not expect users to poke around inside. Getting at the internals appears impossible without tearing the ribbon cable that connects the keyboard, but levering up the front and squinting inside reveals a well constructed and neat PCB, with no obvious 'kludges' or last-minute changes of mind.

The Z80A runs at 3.58 MHz and there is 8k of onboard ROM (expandable to 16k via expansion cartridge) and 20k of RAM. Of this 20k, 16k is needed to handle the display and about 1k is used to handle various system chores — so the user is left with about 3k only for programs. Inserting the Basic-G cartridge adds another 4k, but this is still very limited in comparison with other machines in the same price range and may well be a big drawback as far as sales are concerned. But then again, limited memory does not seem to have done the VIC-20's sales any harm!

The keyboard is reminiscent of the Spectrum's but has a much better feel to it. The keys are rectangular, with a small piece cut out of the bottom left hand corner, and are positive in action; there is a satisfying click as the Sord accepts input. Characters and keywords are detailed in yellow and white, but some of the yellow letters are extremely hard to pick out on the dark grey background. The key positions take a bit of getting used to as well — I found myself getting confused between the RETURN and SPACE keys and the CTRL and FUNCTION ones. There are 64 graphics characters — 32 of which are represented on the keys and the other 32 are accessed via the SHIFT key. The separate power supply is switched (other manufacturers please copy) and a red LED on the keyboard indicates when power is on.

Basic-I

The Sord M5 cannot function without a ROM cartridge in place so, before switching on, the lid above the keyboard must be raised and a cartridge slotted in. The lid appears somewhat flimsy at first sight, but in fact is cunningly designed to come off if undue force is exerted.

Basic-I is the cartridge supplied with the M5. I assume the 'I' stands for 'Introduction' as this is a very simplified and limited dialect.

It is integer-only, and calculations are restricted to the range –32767 to 32767. This limit applies even in the middle of calculations that result in an in-range figure. So, for example, PRINT 2000*50/100 gives an overflow error message, while PRINT 2000/10*50 is okay. The manual does not make this clear — it warns that the final result must be in range but says nothing about intermediate steps.

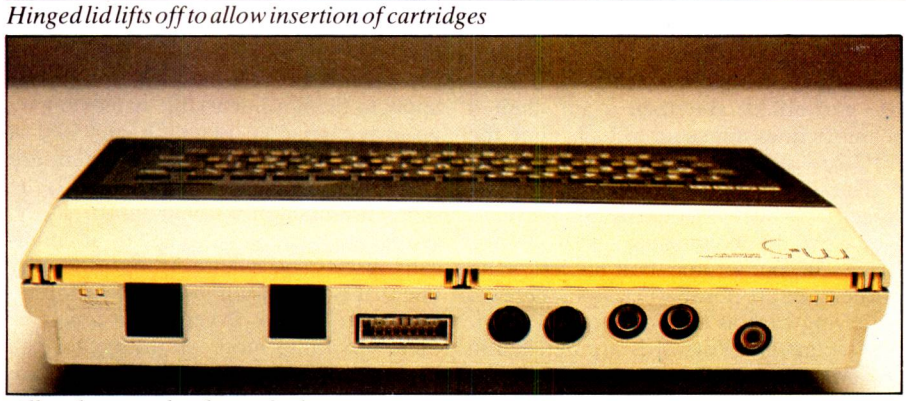
The Basic seems to be fairly standard Microsoft-style, but the restrictions against using embedded keywords that are present in many dialects thankfully do not apply to the Sord. Variable names can be up to 16 characters in length, and LET is optional. Upper case and lower case are totally interchangeable — 'TOTAL' is the same variable as 'total', and 'run' or 'RUN' are equally permissible. The M5 automatically inserts spaces into listings; the only one that is compulsory is the space after a keyword. This is a very nice touch — there's nothing more offputting for the beginner than to have his/her program continually hang up because of missing spaces in input lines.

For a Basic that is obviously designed for the beginner, though, the manual does not do its job very well. The mistakes begin in the first section, where the manual insists that the cursor is a letter 'A' whereas it is, in fact, 'L', 'C' or 'G' depending on the mode selected. The manual writer also seems to have trouble distinguishing between colons and semi-colons — the former are referred to as semi-colons on numerous occasions. The instructions for the DELETE command are also given wrongly, with a full stop shown instead of a comma. These are all relatively minor points, but one which could give the beginner some problems. It's not inconceivable that a newcomer, on seeing the letter 'L' instead of an 'A' as the cursor, could think that his new computer is malfunctioning and return it to the shop. Sord needs to revamp the manual with some urgency: it is imperative that an instruction booklet for the computer novice should be as complete

SORD M5



Hinged lid lifts off to allow insertion of cartridges



All sockets are clearly marked

and error-free as possible.

Basic-I supports simple graphics; these are accessed by pressing the FUNCTION key together with numeral 3. Basic-I does have some sophisticated commands for such a limited dialect: facilities such as automatic line numbering are supported, and the FRE function takes several parameters, detailing amount of memory used and amount of memory remaining. Various control codes are used for changing screen modes, cursor movement and — particularly useful — scrolling the screen. Most computers require special routines to scroll the screen sideways; with the Sord this is accomplished simply by inserting the relevant control codes in PRINT statements. A complete list of control codes is given in Table 1. Basic-I commands and functions are detailed in Table 2. In normal operation Basic commands are entered one letter at a time, but by using the FUNCTION key plus the initial letter of each command they can be entered Sinclair-style — ie, FUNCTION plus 'P' gives PRINT.

Basic-G

The Basic-G cartridge is sold as an optional extra at just under £35 but is really an essential purchase as the full power of the M5's graphics, and sound cannot be realised without it. Basic-I is essentially a limited subset of Basic-G and all the facilities mentioned in the Basic-I review above are present in the G version.

With Basic-G in residence, the Sord becomes a remarkably flexible and powerful machine. The facilities offered are quite astounding for a small personal computer and, of course, the sprite capabilities and 16k video RAM make the M5 a superb games machine.

There are four screen modes: text, which gives 24 lines of 40 columns, with characters defined on an 8x6 grid; GI, which gives 24 lines of 32 columns and all the keyboard graphic characters; multi-colour (or, as Sord insists, 'multi-color'), which allows you a limited mosaic graphic capability with a 4 x 4 pixel block, giving 64 x 48 distinct locations; and GII, the full sprite graphic mode. GII allows up to 32 moving sprites to be defined, with a 16-colour static background and a 'back-light plane' which can also be coloured in any one of 16 shades.

The M5 also features two alternate screens, named 'screen 0' and 'screen 1'. Of course, as a TV can display one screen only, one screen is always hidden from view. Use of various control codes enables the user to flip from one screen to another, and it is also possible to have one screen on view while you input text or information to the hidden screen. Each screen can be set up in a different mode (with the exception of GII and multi-colour). And that's not all . . . in every mode except GII you can use 'expanded screen buffers' which, says the manual, 'can be envisaged as eight extra screen buffers added to the two display screens'. These provide a very quick and simple way of animating characters — if a character is displayed on the various screen buffers in a slightly different position on each, the illusion of motion is achieved by flipping through the screens in the same way as flicking the pages of an animated cartoon book. Any of the 224 displayable characters can be user defined by means of the STCHR command so, even without sprites, some very classy animated graphics can be achieved.

But it's with the sprites that the M5 really comes into its own. The M5 has 32 sprite planes, the background plane and the backlight plane. A background is set up on the 256 x 192 resolution background plane and up to 32 sprites can move individually, each on their own plane. Sprites can be as small as an eight pixel by eight pixel matrix or as large as four 16 x 16 matrices. They can be joined up or split apart at will and, because positioning is determined by pixel position, movement is extremely smooth and impressive.

Sprites are assigned 'sprite codes' with the SCOD statement, are coloured with SCOL and are displayed with LOC (for 'location'). They are numbered hierarchically from 0 to 31, with 0 as the highest level. A higher level sprite will hide a lower level one — so if sprite 0 passes over sprite 5 and they are both the same size, sprite 5 will be hidden. It is also possible to set up screen windows or 'viewports'. To erase a sprite, you simply need the command ERASE together with the relevant sprite number. So setting up moving graphics on the M5 is very easy — and the results are extremely impressive. In fact, for any application involving moving graphics, the limited memory of the M5 is hardly a problem — on most other computers setting up the screen and feeding in the graphics code is going to use a large amount of memory. On the Sord all the hard work is handled for you and the constant 16k video RAM means that you do not have to 'steal' memory from the user RAM in high-resolution modes.

While your sprites are busily dashing around the screen, the background can be set up in detail. The M5's CIRCLE statement will draw circles (surprise, surprise!), polygons, ellipses, arcs or fans (very useful for pie charts) by simply changing the parameters; there is a BOX statement for drawing squares and rectangles; the BAR statement for displaying solid rectangles; and PAINT for filling an enclosed area with colour. Using graphics, a single pixel may be coloured in any one of 16 shades by using the FCOL statement, but as on the Spectrum a character may contain at most two colours. To display a character on a graphics screen it is simply necessary to add '#1' to a PRINT statement. This is, of necessity, a brief rundown only of the graphic capabilities of the M5 — a full exploration of the various effects would take considerably longer than the couple of days I was able to spend with the GII cartridge. Suffice it to say that the M5 makes professional graphic effects very simple for even the beginner to achieve.

No colour (transparent)	Light red
Black	Dark yellow
Green	Light yellow
Light green	Dark green
Dark blue	Purple
Light blue	Grey
Dark red	White
Cyan	
Red	

Table 3 Colours

One particularly impressive feature of Basic-G is its use of interrupts. Interrupts allow you to break off from a specified task to handle something different, then return to the main job in hand. Basic-G has six different statements to handle various interrupts. ON COINC GOSUB takes care of any collisions between sprites — whenever a collision occurs, the program branches to the relevant subroutine. ON EVENT GOSUB accesses the internal timer, which is set by the user. Each time the set timer period expires an interrupt is caused. There is also a built-in alarm timer that is useful for setting a single time limit. This is serviced by an ON ALARM GOSUB statement. ON KEY GOSUB and the delightfully named ON JOY GOSUB service interrupts from the keyboard and from the joypads. Finally, ON ERROR GOSUB enables a GOSUB statement to be called whenever an error occurs while drawing graphics pictures. Unlike the other interrupts, this one cannot be turned on and off by the user.

The M5's internal timer is extremely versatile. The TIME$ statement sets the clock time in the format TIME$ = "hh:mm:ss". WAIT suspends operation for the prescribed time; after this an interrupt is generated and the appropriate subroutine called. SLEEP is very similar, but instead of calling a subroutine it simply carries on with program execution after the prescribed period is exceeded.

There are also some more features for handling PRINT statements and screen formatting. MPRINT allows the user to separate a character and display different segments on different lines; and there are two statements — DIST and DRCT for calculating the distance between sprites.

Basic-G is almost overburdened with features — for example, there are four different LIST commands. These are the normal LIST, which displays all or part of a program listing on the screen or on the printer; LISTC, which is as LIST but which lists everything out in upper case; ELIST, which is the same as LIST but which clears the screen first; and ELISTC, which is as ELIST but with everything in caps. Although the M5 lacks REPEAT UNTIL and WHILE/WEND, IF...THEN... ELSE is supported and the use of labels as destination addresses for subroutines makes structuring of programs easier.

All in all, Basic-G is sufficiently sophisticated to handle just about any situation involving graphics and, although integer-only, combines ease of use with power and flexibility. For full floating-point capabil-

A	not used
B	return cursor to beginning of line
C	scroll screen display down
D	scroll screen display left
E	scroll screen display up
F	scroll screen display right
G	bell
H	backspace
I	tab cursor eight spaces
J	move cursor down one line
K	move cursor to home position
L	clear screen display
M	same as RETURN key
N	move cursor to beginning of next line
O	change to standard mode
P	change to insert mode
Q	change to multi-colour mode
R	change to GII graphics mode
S	change to GI graphics mode
T	return to text mode
U	change to visible screen
V	alternate between visible and invisible screens
W	same as RETURN key
X	delete characters to right of cursor
Y	alternates between visible and invisible screens
Z	writes input to alternate screen

Table 1 Control codes

AUTO	LOC
CLEAR	MAG
CLS	SCOD
CONT	SCOL
DEL	STCHR
LIST	VIEW
LIST#2	VPOKE
NEW	ASCII
RUN	CHR$
CHAIN	HEX$
DATA	INKEY$
INPUT	LEFT$
OLD	LEN
OUT	MID$
PRINT	RIGHT$
PRINT#2	VAL
READ	CURSOR
RESTORE	ERR
SAVE	ERRL
TAPE	ERRL$
VERIFY	PEEK
CALL	VPEEK
DIM	ABS
END	FRE
FOR...TO...STEP	INP
GOSUB	NUM$
GOTO	RND
IF...THEN...ELSE	SGN
LET	TIME
NEXT	
POKE	
RANDOMIZE	
REM	
RETURN	
STOP	

Table 2 Basic-1 commands

512 x 512 GRAPHICS

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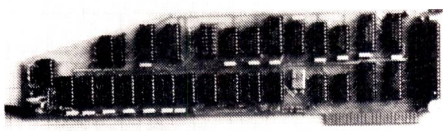
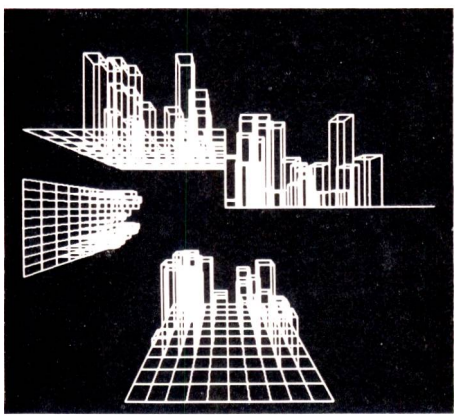


APPLE II CARD



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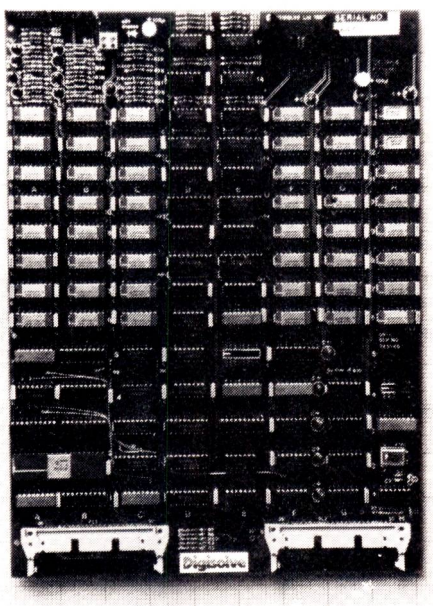
* £399 + VAT + P&P

SOFTWARE: Visicalc and Applewriter pre-boot. Architectural Design & Modelling. Kitchen Design. Draughting. Report Presentation.

Turtle Graphics, TASC & Apple Soft software support.



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VGP 64

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* In monochrome 12 pictures may be stored and selected for display under software control individually or for animation
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SORD M5

ity, the user will have to purchase the Basic-F cartridge.

Sound

The Sord takes the sensible course of using music notation to program the sound generator — PLAY 'c' gives you, funnily enough, the note C. Sharps and flats are handled by suffixing the note letter with a plus or minus sign. The M5 provides up to six octaves and defaults to octave five, in which note C is middle C on a piano. To change octave it is simply necessary to insert a lower case 'o' and a number for the relevant octave. Note duration is specified by inserting a number without the letter 'o'; when first switched on the M5 plays quarter-notes. Dotted notes are dealt with by the simple expedient of inserting a full stop in the PLAY statement, and triplets are denoted (ouch!) by an exclamation mark. To continue with the logical approach, Sord has decided that rests should be indicated by use of the letter 'r'.

Up to three notes may be played simultaneously to create harmony — this is done by separating the notes in the PLAY statement with commas. Volume is set in the range 0-15 by including 'V' and the relevant number at the beginning of the PLAY statement (volume is set at maximum on switch-on) and tempo is indicated by the letter 'T' and a number in the range 1-255. There are eight different 'envelope' shapes for changing the sound of each note; these are set with 'S' and a number.

Of course, music is not the only use for the M5's sound capabilities — arcade-style effects are easily obtained by using the SG statement.

All in all, the M5's sound capabilities are more than adequate and the logical method of defining sounds and music means that even a complete novice should be able to achieve some good effects — a definite plus-point.

Cassette

The M5 uses an ordinary cassette player for storage of programs and data, but once again Sord has done everything in its power to make things easy for the user.

The M5 uses an eight-pin DIN plug to connect to the user's tape machine and supports a 'remote' facility. Files are saved with SAVE "file name" or LIST "file name" and loaded with CHAIN "file name" or OLD "file name". SKIP can be used to 'skip over' files already on cassette, thus finding the first piece of blank tape. When programs are loaded back into the machine FIND "file name.BG" . . . is displayed, with the 'BG' suffix denoting Basic-G, or 'BI' if the file was saved under Basic-I. The dots after the file name and suffix give an approximate idea of the length of the file, with each dot representing 256 bytes. Programs can be verified, and the whole operation seems very reliable. While I was reviewing this machine every program I tried saved and loaded first time and the M5 seems very tolerant of volume variations. It is also possible to save a screen — in this case VSAVE is used, but it should be noted that it's the alternate screen buffer that's saved, not the screen currently being displayed. So to save the displayed screen it is necessary to hit CTRL V and then type VSAVE: saving the screen takes about two minutes. When reloading a screen, care should be taken to ensure that the screen buffer is set to the mode the retrieved file expects — so when saving a screen it is advisable to note down the screen mode and screen buffer involved.

Documentation

As mentioned above, the instruction manual for Basic-I leaves a lot to be desired. In contrast, the Basic-G manual is clearly written and, on the whole, accurate. In particular, the sections devoted to sprite graphics are very easy to follow and should make it easy for anyone to come up with some stunning graphics.

My only major quibble is the complete lack of information concerning memory addresses. I know it's possible to PEEK and POKE addresses in both user RAM and video RAM because these commands are mentioned in the manual glossary — but nowhere in the text does it tell you how to use these commands and what will happen if you do. CALL is also mentioned in passing as a means of executing assembler programs, but once again no further information is given. This is a serious omission as Basic-G is designed to be sufficiently powerful to attract the more advanced programmer who would want to use machine code.

But the manual certainly scores in the way it takes the user logically and carefully through the intricacies of Basic-G. It is well-written and thankfully is not subject to the mangling of the English language that was once almost compulsory for Japanese manuals.

Expansion

The M5's design lends itself to expansion — the slot for various ROM cartridges means that other languages can be added with the minimum of fuss. As yet, the company has released no details of forthcoming languages, but there is a 32k memory upgrade in the pipeline which will increase the machine's appeal considerably. There are also plans for a printer (the M5 has a built-in Centronics interface) and disk drives which, in combination with the FALC database and spreadsheet, could turn the M5 into a small business machine.

Conclusions

The Sord M5 is not a cheap computer and is impeded by a somewhat limited memory. It is bound to suffer in comparison with machines like the Spectrum and Oric, which both offer 48k at a considerably cheaper price.

That said, it must be admitted that the M5 makes graphics programming extremely simple and allows some stunning effects to be achieved with the minimum of fuss. It will therefore appeal to the games programmer — although the lack of information about memory addresses is something that needs to be rectified to attract the machine code fanatic.

It is a pity that the M5 comes supplied with the Basic-I cartridge only. Although useful as an introduction to the complete beginner, Basic-I is not powerful enough to use the machine's capabilities to the full and I feel that Basic-G is a vital purchase. However, at £34.95, its purchase will put the price of the M5 up to nearly £225.

The M5 is beautifully designed and constructed; it definitely has the air of a 'quality' machine. If Sord would only include Basic-G in the basic package and knock fifty quid or so off the retail price, the M5 could well be a winner. As it stands at the moment, it is an attractive machine with much to recommend it — but unless the price comes down I don't envisage Sir Clive suffering too many sleepless nights . . .

Prices

Sord M5 (with all leads, two games 'joypads' and Basic-I cartridge)
£189.95
Extra ROM cartridges (Basic-G, Basic-F for floating-point arithmetic, FALC applications package)
£34.95 each

END

Technical specifications

Processor	Z80A running at 3.58 MHz
RAM	4k user memory, 16k video RAM
ROM	8k expandable to 16k via ROM cartridge
Keyboard	55 keys, membrane type
Screen	TV or monitor; four display modes, 16 colours
Sound	3 voice channels, 1 white noise, 7 'special sounds'
Interfaces	Tape (remote control), Centronics printer interface, composite video and sound.

BENCHTEST

DECISION MATE V

Nearly eighteen years ago, NCR gave David Tebbutt his first computing job on its brand new 500 series. Just to show that there are no hard feelings, David offered to go back and review NCR's latest offering — the Decision Mate V.

NCR, like several traditional computer companies before it, has realised that unless it can establish a decent foothold in the microcomputer business it will lose out massively to more enlightened rivals. This is because the world is moving more and more towards distributed computing activities in which microcomputers are being used as intelligent work stations in place of their forebears, the dumb VDUs. Since the mainframe companies had things pretty much their own way when it came to these terminals, they could charge ridiculous prices for them and get away with it. Once micros came on the scene with the ability to mimic any communications protocols, the more adventurous users started buying them — often at a lower cost than the terminals they were replacing. The micros had additional benefits like local floppy disk storage and printing facilities. These made them ideal for applications such as word processing and spreadsheet tasks which didn't need the central mainframe computer. Suddenly the micro, which until then had been dismissed by 'real computer' people as something of a toy, posed a serious threat to these large companies.

It was clear that computer intelligence needed to be moved out to the users simply to avoid the inevitable bottlenecks which occur when lots of them are sharing a single central processing unit. As the prices of disks, memories, processors and printers fell, so the barriers to this distributed approach were removed. Now we can expect the majority of large computer installations to become networks of microcomputers scattered around companies. Each micro will have its own floppy disk drives to hold local information and, probably, a low cost printer too. Each micro will have access, via the network, to centralised computing facilities such as large company files and high quality printers. I don't suppose any major computer manufacturer worth his salt wants to become simply a purveyor of posh printers and mass storage devices, so it has absolutely no option but to get into micros and make sure that its devices end up on the user's desks rather than those of some upstart Silicon Valley company.

Hardware

The Decision Mate V (DMV from now on) is one of the best looking machines I've seen for a long time. The model I tested was mainly cream but with a grey surround to the disks, screen and keyboard. The machine comprises two units — the screen, processor and disk drives in one housing with a separate keyboard connected by a black coiled lead. As you can see from the photographs, the keyboard can be pushed into the recess formed by the overhanging screen and disk housing although, on my cluttered desk, the keyboard spent most of its non-working life on top of the main unit.

The DMV was dead easy to get going. I simply plugged in the keyboard cable and the mains lead, stuffed in a CP/M disk and pressed the orange on/off button. After a short pause while the machine performed its diagnostics, the thing whirred into action. I ran a couple of CP/M programs and then decided to test its ability to read alien disks. I stuck an ITT 3030 disk in drive B and used the Exchange program to tell DMV what I'd done. I then copied the programs on to drive A where they were stored in DMV's native format. I can tell you, I was mightily impressed. I was less impressed when I tried the same trick with an absolutely jam-packed ITT 3030 disk because it just wouldn't copy the tail end of the disk. I'm not blaming NCR yet because I can't find a 3030 to double check the disk, although it seems to be OK on my own 3030 emulator.

If, like me, you have got an Epson MX-80F/T printer with a serial board then you will have no trouble getting it going with the DMV. I can say this confidently because, since I had so much trouble, I'm going to tell you how it's done. You need to connect pins 2, 3 and 7 straight through and printer pin 20 to pin 4 on the DMV's interface cable. Sorry to get technical there but after days of trying to figure it out (the NCR engineer was away at the time) enlightenment finally came through one of NCR's West London dealers, Ludhouse (London) Ltd. Well done chaps, and thanks.

Main unit

It seems as if the bulk of the DMV is manufactured by NCR with the only noticeably alien parts being the half-height, vertically-mounted 320k disk drives from TEAC. I've been using TEAC drives on another machine for a while now and I find them very reliable and quiet. It seems that NCR has made a sensible choice. The machine is extremely well made and, like most micros, an absolute doddle to take to bits. I must have been testing a pre-production model because, looking inside, I noticed that it contained some EPROMs and quite a number of wires linking various bits of one of the PCBs. Unlike most micros, you don't need to take it apart to add expansion boards; they all slot into a recess at the rear. Incredibly, the DMV has no standard connectors. You need to buy special adaptors for Centronics and RS232 connections.

Keyboard

The keyboard is unusual in that it contains, among other things, a whole microcomputer on a chip. This enables the user to choose one of eight language implementations by setting three switches set into the underside of the keyboard. I was supplied with a ready-configured American keyboard, but I understand that they are usually supplied with some of the keys missing and a little pack of national keys from which you choose the set which matches your language. Twenty function keys occupy the top row and these can easily be programmed using a configuration program supplied with the DMV. To accompany these keys, NCR has thoughtfully provided a couple of plastic strips which fit into a channel just above the function key row on which you can jot your chosen functions. The DMV keyboard has a joystick port, an unusual feature on a business machine although I can imagine that for many applications this could come in handy.

My only serious criticisms of the DMV hardware relate to the keyboard. One is that it doesn't have any form of reset key, which means that if a program crashes, the only solution is to switch off and on again. If you're as careful as me then you know that this involves removing disks, switching off, counting to five, switching on again, then reloading your disks. A bit of a performance compared with simply hitting a reset key. NCR tells me that it plans to make the combination of CTL and function key 20 a reset. Talking of control keys, the DMV has one on each side of the keyboard which means that all control functions are a one-handed operation. A nice touch. Not such a nice touch is the fact that NCR has stuck an extra symbol key between 'z' and the left shift key. If you're anything of a typist you will find that your left little finger will unerringly hit the symbol key whenever it goes for the shift.

This drove me crackers and NCR has no answer to that problem (the keyboard that is, not me going crackers).

As you would expect from a company that made a lot of money from cash registers, accounting machines and adding machines, the numeric keypad is quite substantial. As well as the expected numeric keys which include 0 and 00, this pad also contains arrows and calculator-style mathematical function keys. Most keys repeat after about half a second and a keyboard buffer will remember up to eight characters if you are still typing while the machine has dashed off to perform another task. It also contains 'rollover' logic which allows you to be pressing another key while you are still releasing the first one. These last three features are useful for people who spend a lot of time keying in text. Look at the photograph, and you may notice that the keys are an unusual shape. They are nicely dished but the part you hit is almost circular with a bit sliced off the top. At first this feels a little weird for people used to conventional keyboards but you soon get used to it. One of the chaps at NCR described it as the 'Bang and Olufson' look.

Screen

The 12in screen is made of non-reflective glass and can display 24 lines of 80 characters unless you are in graphics mode when it looks as if you can wangle an extra line. The graphics mode gives an impressive plotting resolution of 640×400 points. I noticed that plotting was unusually fast even in colour. Sadly, the graphics programming language GWBasic was not available at the time of this Benchtest so I had no opportunity to fool around with this feature. The people in Germany had prepared their own set of graphics routines which were used in the demonstration program, and if the language is as good as these efforts then you won't be disappointed. The colour graphics (which I saw but didn't have on the review machine) are quite superb.

Overall I think NCR has done a very good job on the machine. Some of the niggly features will have been overcome on the production machines. In particular, a reset capability will be provided and, for those who hate beeps, the speaker volume



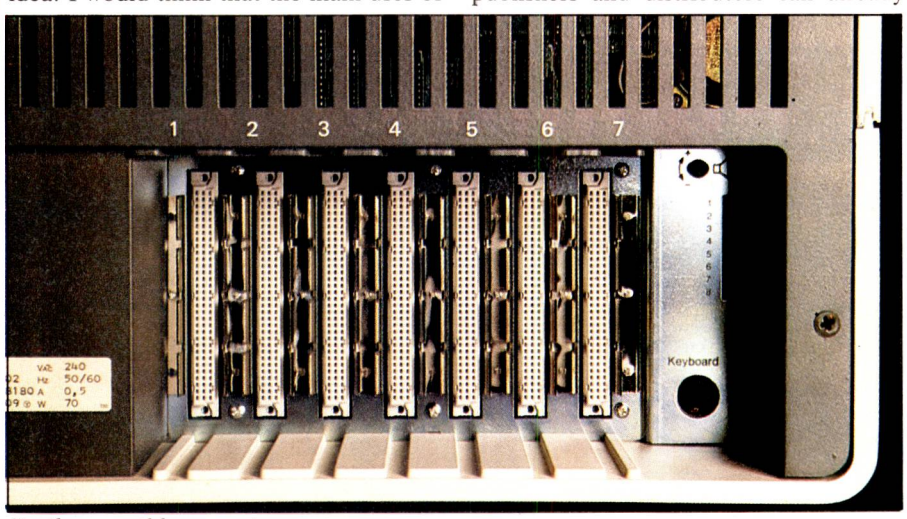
Photography by Andrew Johnston

control has been made more accessible by bringing it to the front of the machine from the recess at the rear. I wasn't going to mention this sound facility because it seemed irrelevant but now I've introduced it, I'd better finish the job. A single channel sound facility is provided and can be activated by sending sequences of hexadecimal numbers to the screen. Frequency and duration are defined in this cumbersome way and the end result sounds ghastly. Why NCR decided to include music in its demonstration suite I've no idea. I would think that the main uses of this feature are to give a keyboard beep, to signal errors and to announce completion of a task. If you've got any better practical ideas then why not write to *PCW*, we'd love to hear them.

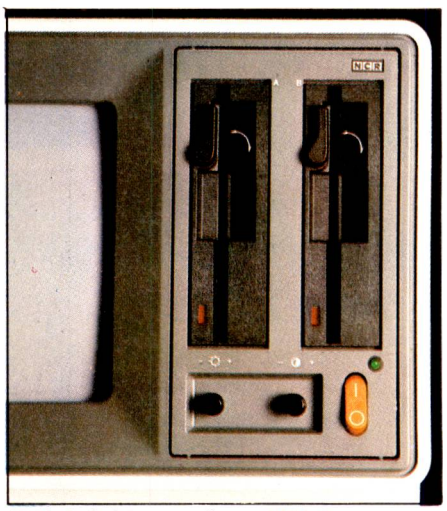
Software

Much of NCR's software has yet to be finished. However, all is not lost because, sensibly, the company has opted for the CP/M operating system and produced a utility which can read disks destined for other computers. These two moves have ensured that there is a plentiful supply of software from day one even if it is not published by NCR. Many British software publishers and distributors can already provide disks in NCR format. NCR publishes regular lists of what is available.

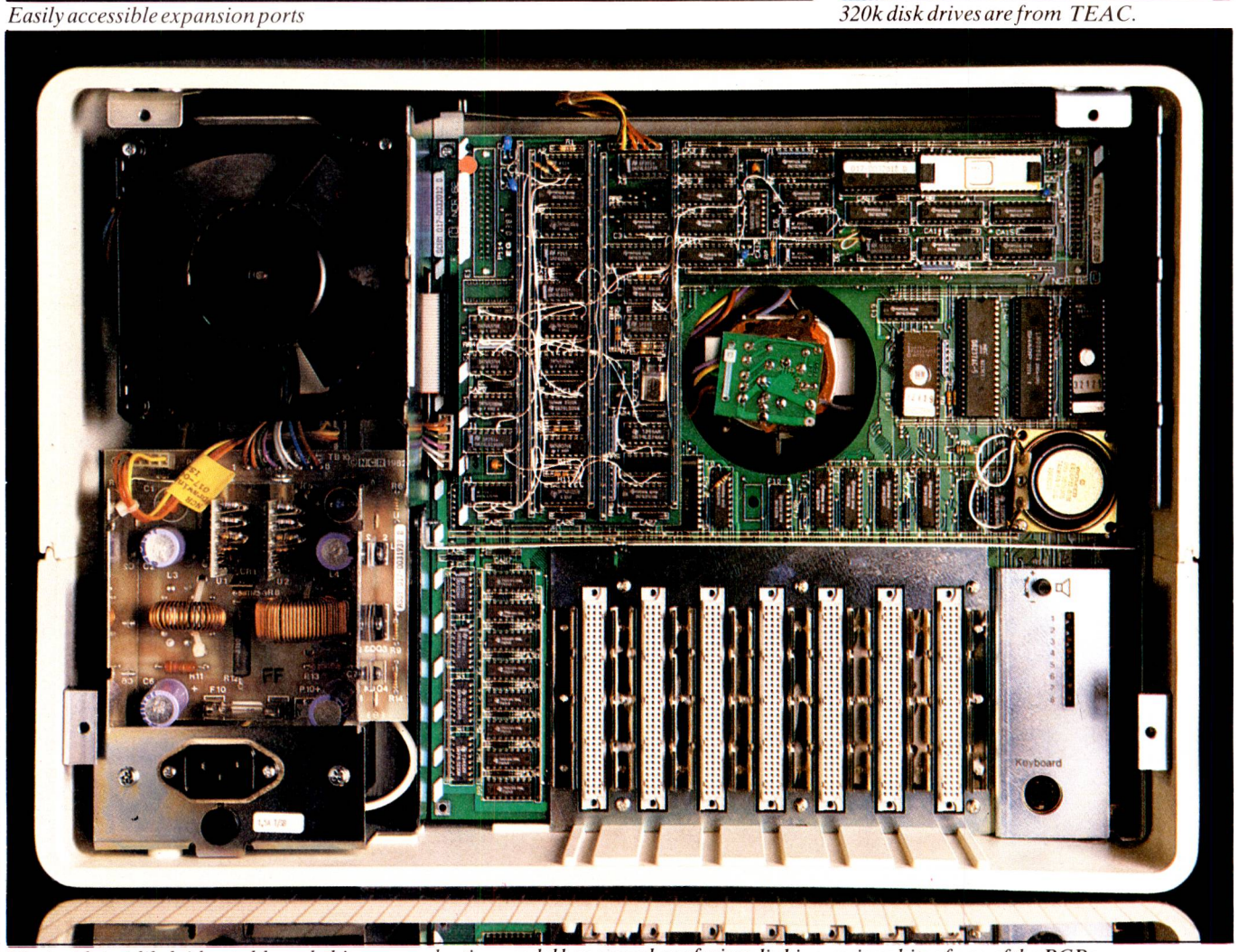
All the proprietary packages I ran worked just fine (WordStar, Cardbox, SuperCalc, Touch 'n' Go and Optimiser). NCR has replaced the CP/M format command with one of its own design which didn't impress me greatly. Someone in NCR has decided that menu-driven programs are the thing to do these days so it asks you to enter '1' to format or '2' to exit. What's wrong with 'F' and 'E' or 'X'? Another irritation is that it asks for the drive letter but it will only accept the upper case version of the letter. This sort of thing was rife when software first started to appear on microcomputers but now most companies have learnt differently. Sadly,



Easily accessible expansion ports



320k disk drives are from TEAC.



The inside is tidily laid out although this pre-production model has a number of wires linking various bits of one of the PCBs.

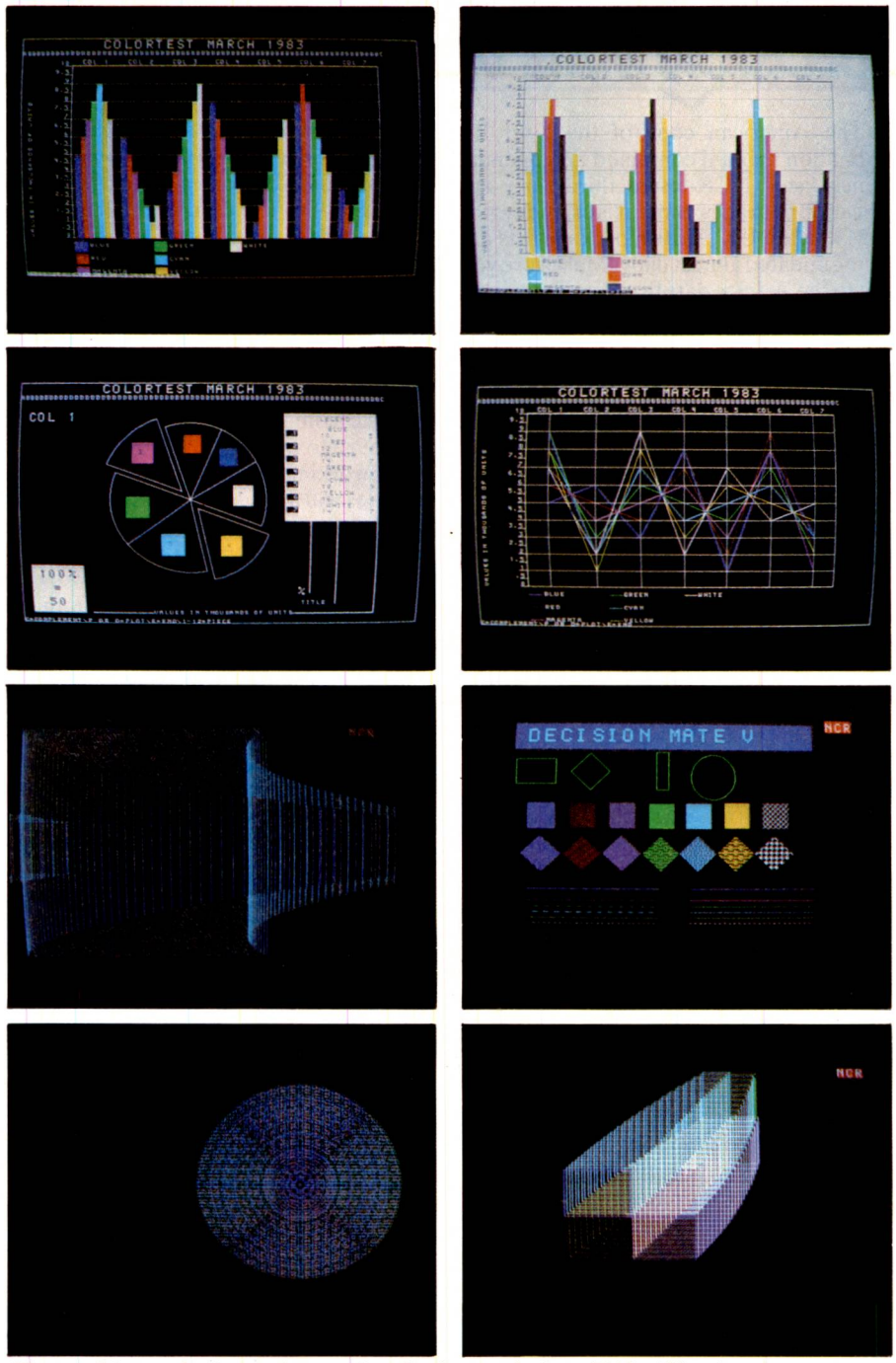
all the examples I had of NCR's programming were of this level of user-friendliness. On a scale of nought to ten I would have to give them two or three. But, as I said earlier, the company has opted for CP/M which means that the majority of packages have been written outside NCR. CONFIG is another NCR program which does the job OK but the instructions follow this strange numbered menu pattern. For example, where's the sense in a command like this:

Modify character length
1 — 5 bits
2 — 6 bits
3 — 7 bits
4 — 8 bits

Maybe NCR figured you wouldn't need to use the CONFIG program very often so it didn't matter too much about being user-friendly. Another thing about CONFIG that I don't like is the fact that it is incapable of telling you the current configuration settings.

Our old field Microsoft Basic has turned up on this machine and it produced Benchmark timings which are just slightly better than the SuperBrain's — a very comparable machine. Oddly enough I'm writing this article on a SuperBrain but if I'd had Spellbinder (my favourite word processor) on the NCR, I would have used that. Don't get too concerned about Benchmark timings. These were developed in the dark old days when machines were fairly simple and used mainly by hobbyists. Their emphasis is mainly mathematical and relates only to the internal operations of the machine. In business, other factors are more important such as disk capacities, keyboard layout and whether the program spends a lot of time waiting for the user to do something. You can have a superbly fast income tax calculation for example, but if the operator pauses for a few seconds before entering the hours worked, this will negate all the benefit of having fast processing speeds. Microsoft Basic has been described so many times before that I won't trouble you with its details. The important thing is that it is an industry standard and many programmers are quite familiar with it.

The Exchange program was prepared by NCR and has the same hallmarks as those mentioned earlier. This is the program which allows you to define drive B as if it were another computer's disk drive. The four choices you have are ITT 3030 (DS), DEC VT100 (SS), Zenith Z100 (DS) and Alphatronic P2U (SS) where DS means double-sided and SS single-sided. All disks are double density and the DMV can read and write these alien formats but it cannot format appropriate fresh disks.



The graphics mode gives an impressive plotting resolution of 640 x 400 points. Colour graphics are superb and plotting is very fast.

Documentation

The manuals I was supplied, User Information and NCR CP/M, were two of the best manuals I have ever read. Both the layout and content of each manual were excellent. The ones I was given were A5 perfect bound, but just before I finished this Benchtest I saw that NCR was adopting the IBM style of cloth bound and boxed manuals. The chapter in the User Information manual called Helpful Hints makes excellent general reading for newcomers to computing because it covers very important but basic things such as handling diskettes, positioning the computer, orderly working and moving the computer. The bad news is that neither manual contained an index.

I read each manual through from cover to cover and, while I noticed a number of typos and a couple of actual errors, the bulk of the stuff was accurate and clearly explained. In fact I learned quite a bit about the backwaters of CP/M and I've been using it for four years or so. The worst bit of the user manual was the first two sentences of the foreword:

Congratulations on your selection of NCR Decision Mate V as your new professional business partner. Using state-of-the-art technology and modular design philosophy, NCR Decision Mate V offers features for both the experienced and first-time user, providing flexibility in choosing processing capabilities and options.

I got the feeling that this was a direct translation of some foreign language. It also sounded vaguely Japanese as does the name Decision Mate V!

Benchmark timings

BM1	1.6
BM2	4.8
BM3	12.8
BM4	12.8
BM5	13.7
BM6	24.3
BM7	38.5
BM8	6.9

All timings in seconds. For a full explanation of benchmark timings, see PCW November 1982.

DECISION MATE V

The American copy of the User Information manual contained an appendix which listed NCR-tested third-party application packages. Since it is early days for DMV in the UK, British package lists are being updated almost daily. Make sure you get to see an up to date list if you get serious about buying a DMV.

Future plans

I have described only a part of NCR's master plan to establish the DMV. In the fairly near future, say, by September, you can expect to see a few more languages, a few more application packages and some additional hardware goodies. Later on we should expect evidence of NCR's commitment to communications systems beginning to show.

First, the languages. A graphics Basic called GWBasic will be launched to enable the programmer to take advantage of the almost inaccessible graphics facilities available. A version of Pascal should make an appearance along with Fortran and Cobol. I can't tell you which versions of these languages will be launched although as a patriot I would like to see MicroFocus get the deal with its CIS-Cobol. In America, Microsoft's Cobol-80 and Ellis Computing's Nevada Cobol are listed as having been tested for the DMV. Whatever NCR goes for, you will still be free to choose a different implementation.

NCR will be publishing GSS-Graph from Digital Research which is a graphics driver package. It will also be putting out CP/M Plus and, when the dual processor version of DMV comes along, MS-DOS and CP/M-86. The users of dual processor machines will be able to choose either MS-DOS or CP/M-86 to be supplied free with their machines.

Application packages that NCR will be distributing are WordStar Plus (a blend of WordStar, MailMerge and SpellStar), DataStar, InfoStar and CalcStar. (Sounds like the company has done a deal with MicroPro to me!)

Networking and terminal emulation facilities will appear next. NCR thinks this will happen by the end of this year. I don't know anything about the proposed terminal emulation software but the networking will be based on the Corvus Omninet system. This allows micros to team up in a network through which they can exchange information with each other. The addition of NCR's MODUS allows these same users to share mass storage and expensive peripherals such as high quality printers. The whole deal is referred to by NCR as Decision Net. It looks interesting but it's all on paper in the UK.

Communications seems to have led us neatly to hardware offerings and the three other big ones are the ten Megabytes Winchester disks, the colour screen and the dual processor (Z80A and 8088), none of which you can expect much before September. No doubt memory expansion modules will come along with the 16-bit processor, I'm not at all sure that it is usable before then. A diagnostic module which tucks into one of the rear ports and tells you what's wrong should be available fairly soon.

UK suppliers of tested software

Caxton Software Ltd
Compact Accounting Services
Comshare Ltd
Derwent Data Systems
Graffcom Systems
Intelligence (UK) Ltd
Microcomputer Business Systems (MBS)
Minicomputer Commercial Software (MCS)
Microcomputer Products International
Prospero Software Ltd
Padmede Computer Services
Sapphire Systems
Tridata Micros Ltd

Price and availability

For just under £2000 you can get a basic configuration of a 64k, Z80 DMV with a printer cable (serial or parallel). CP/M, EXCHANGE and CONFIG are included in this price. For an 8-bit machine it is quite expensive. I would presume that you will be able to upgrade to the dual processor when it comes along although I cannot find any specific mention of this in the documentation.

NCR will be selling the DMV through a dealer network and through its existing sales force in the course of its normal activities. The kit is being shipped in quantity to the UK as you read this so availability shouldn't be a problem.

As with IBM and DEC, I feel that people will buy this equipment because of the company behind it rather than for reasons of price or benchmark timings. The company offers maintenance contracts either directly or through its dealers which, at best, put the engineering staff on call to you during normal working hours or, at worst, allow you to take your sick DMV to a depot for repair. In between, you can call engineers out on a time and materials basis or go to your nearest NCR trained dealer for repairs and maintenance.

Prices (June 1983)

	£
64k, Z80 DMV, Monochrome, CP/M	1825
256k, 8088 DMV, Colour MS-DOS	2795
64k memory expansion	230
Centronics printer interface	165
RS232 printer interface	130
Blank interface adaptor and bus connector	65
Diagnostic module	325
RS232 modem interface	105
10 Mbyte Winchester upgrade	2100
8088 internal upgrade	350
8088 external plug in upgrade	420

Conclusions

NCR has made an impressive entry into the microcomputer marketplace. It seems to have played safe by looking around at what's good and popular and building from this kit of 'approved elements'. In places NCR seems to have gone adrift — the joystick springs to mind — but, in the main, it has got things right. The machine is very well made and the choice of CP/M has made thousands of programs instantly available. The plans for the future seem pretty sound. By moving to the 8088 processor and to CP/M-86 and MS-DOS, NCR can hardly go wrong. IBM has kindly paved the way. The future for networking systems looks good. It seems that the Omninet system will allow you to string together various other micros you may have knocking around. This is already a very serious consideration in companies whose micro purchases have become a little out of control.

Having chosen the elements of the machine, NCR has done an excellent job on the design and quality of construction. The machine would credit any office on looks alone. The price seems to be a bit too high around £2000 for a usable basic unit. To this you would need to add a printer. But, as I said earlier, to a certain extent you are buying the company as well as the hardware and software. I'd take NCR very seriously, it is taking a very practical and serious approach to personal computers.

END

Technical specifications

Processor	4MHz Z80A and 8088
Memory	64k expandable to 512k, graphics uses its own memory — 32k monochrome and 96k colour
Screen	12in green on black (colour coming) 24 x 80 or 640 x 400
Keyboard	Low profile full ASCII, numeric keypad and 20 programmable function keys
Disks	2 slimline TEAC drives of 320k each. 10Mb Winchester on its way
Interfaces	Weird slots at rear mean buying NCR adaptors and cables; RS232, Centronics and 'make your own' available
Operating systems	CP/M now, MS-DOS and CP/M-86 later
Languages	MBasic now, GWBasic, Pascal, Cobol and Fortran later
Dimensions	38cm high × 46cm wide × 37cm deep
Weight	24kg + 1.5kg (keyboard)

Moore on Kuma



NewBrain software

A feast of software is contained in our new NewBrain catalogue coming out mid-July. Available free of charge, it includes the following new programs:

ZEN Editor/Assember

Allows the user to write in assembly language and create executable object files in machine code. It is very easy to use and has been proven to be excellent over five years. Suitable for NewBrain A or AD at £29.50 plus vat.

NDUMP

For the first time, users can now dump NewBrain hi-res graphics onto the Epson MX80 SX80 or Shinwa CP80 graphics printers.

NBUG

This is a powerful machine code debugger and monitor. (See the catalogue for full spec.)

Sharp P6 interface

With the new Kuma interface for the Sharp MZ80A, users can run a P6 printer without the need for the Sharp I/0 box. If the printer is the only peripheral you need, our interface is a must at £85 plus vat.

Sharp comms board

A unique interface board, which plugs directly inside the MZ80A in place of the Sharp I/0 box, has been developed by Kuma.

It offers 2 x RS232C ports; 1 x Centronics parllel printer port; 1 x Bidirectional parallel port; and space for a 2732 ROM chip. And come complete with a timer.

The cost of the board, which allows users to communicate with mainframes, printers and other intelligent devices, starts at £174 plus vat for the simplest configuration. This is a major expansion of the Sharp system and we expect many exciting new products to be developed around this remarkable board.

EM Phone Home!

We have joined the Telecom Gold electronic mail (EM) service, so you can now talk to us via this or BL Comet.

Another interesting EM development is that we are combining our leading Sharp word processing package WDPRO with a communications package that can be readily used with EM on the MZ80A. This additionally opens up other applications for WDPRO such as phototypesetting over the phone.

While on the subject of word processing, don't forget we have a name and address merging program for the MZ80A called MAILPRO at just £69.50 plus vat.

HX-20 Foreign Exchange

For just £19.50 plus vat, you can detect trends in currency rates using historical figures as far back as Jan 1981. 64 exchange rates including cross rates (USD to Yen, DM to FFr, etc.) are available.

The program allows you to produce listings of currencies and calculate amounts to and from the chosen currency. It's invaluable for exporters and importers.

Deskmaster Database

Latest in the Deskmaster series for the HX-20 is Kuma's DM9 RAM Database.

Available in two version, 16K and 32K for the standard and expanded models respectively, it's ideally suited to applications where a manual card index system is currently used.

The 16K version yields 63 records (cards) and the 32K version 205. Both cost £29.50 plus VAT each.

Free HX-20 Catalogue

The Kuma HX-20 software catalogue can be had for the price of a phonecall. It contains full details on the new programs mentioned here, and on the rest of the ever-growing Deskmaster series, which includes:
Spreadsheet Calculator;
Friendly Terminal — links HX-20 to Sendata acoustic coupler for low cost entry into electronic mail;
Wordprocessor;
Home Budget — keeps track of personal and household expenses;
Office Aid — gives HX-20 desk top calculator functions;
Decision Maker — helps user make difficult decisions involving up to 14 options, eg choosing candidates for a job, marketing strategy, even a choice of colour;
Electronic Mailbox.

There is also a new Entertainments Package holding four games, and an Expenses Package for people who have to complete weekly or monthly expenses claims.

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HX-20 users can generate self-adhesive labels till their heart's content with our Deskmaster Labeller and special sticky labels which feed through the computer without jamming.

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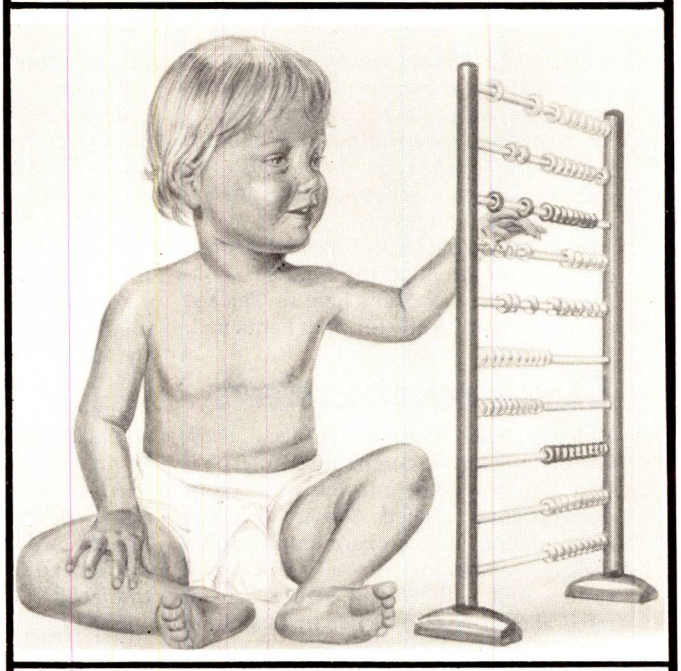

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MY KIND OF SHOW...

Our transatlantic traveller Robin Webster reports back to us on innovations in the computer industry from the Consumer Electronics Show in Chicago.

Who would have expected that at an exhibition best known for its displays of the latest home video films, novel telephones, noisy toys and ear-splitting quadrophonic systems for Porsches, there would also be a rash of significant announcements for the microcomputer industry?

As it turned out, few of the 80,000 or so people who attended the Summer Consumer Electronics Show held in Chicago (June 5-9) were ready for what happened.

Main contenders

Video games company Coleco (best known for its Atari-competitive ColecoVision games system) introduced a colour microcomputer called Adam. Or to be more precise, the company introduced a package consisting of: a Z80A-based system unit with 80k or RAM and an integral data storage device that can hold up to 500k; a keyboard with joystick cursor controller; a letter-quality (daisy-wheel printer); ROM-based word processing; a Basic language pack, called Smart Basic; and a games pack, called Buck Rogers — The Planet of Zoom.

The whole system, as described, will cost about $600, according to the company. Another Adam version, which simply upgrades a ColecoVision video games machine into an Adam system will sell for around $400. Both versions will be made available in the UK at some point.

Commodore, which has already featured in the cut-price computer market, drew much attention with what was described as 'the largest single software introduction in the history of the company'. About 70 new software products for the Commodore 64 and VIC-20 were either on show or being seriously discussed at the Commodore stand. While many of these were games and educational packages, the company slipped in a few demos of a product called 'Magic Desk'. Although it is still in the prototype stage, Magic Desk has some features in common with (albeit at a much cruder level) the Desktop Manager software available on Apple Computer's Lisa system.

Other Commodore events were the introduction of a portable computer called the Executive 64 which not only has a colour screen and costs $995, but can be made to run CP/M or PET programs with the addition of suitable options; and the welcome announcement that the company intends to sell Microsoft's Multiplan spreadsheet system for under $100 on the Commodore 64 computer.

Atari, is also trying to shake loose its image of being 'just a games machine maker' with great gusto. It publicly announced four new computers — called the 600XL, 800XL, 1400XL, and 1450XLD —, a CP/M add-on that works with all Atari systems, the AtariWriter word processing system priced at $99.95, a 16k Logo language cartridge, a disk-based colouring and drawing package called Paint, a light-pen, a touch-pad, and many more pieces of hardware and software.

More privately, in a nearby hotel suite, Atari was willing to discuss and display some experimental work it has been doing, such as Atari Artworks (a menu-based, free-hand drawing system which provided similar facilities to Apple's LisaDraw) and an as-yet-unnamed free-hand drawing system which combines an on-screen line/shape/and colour palette with the ability to store 'pictures' on visibly displayed cards or windows. Once a picture or a group of pictures are saved in this way, the cards themselves can be electronically put away and later retrieved. In other words, graphic images are not just saved in the traditional sense, they are *seen* to be saved in the current 'metaphor' fashion. In the case of Atari Artworks it is possible to use either a light-pen or touch-pad (to suit the task); in the case of the unnamed system, a light-pen is the device currently used.

While the three above-mentioned companies were the major combatants in what is now obviously a home-computer price/performance war, others carried on in their own way.

In the background —

Very quietly, Tomy, a Japanese manufacturer of wind-up toys, and similar playthings, was showing off its Tomy Tutor machine at the show. Designed for 8-year-olds, the machine has a 16-bit TI 9995 chip inside it which is said to operate at an incredible 10.7 MHz! The basic machine is expected to cost less than $150 when it is marketed in a few months time.

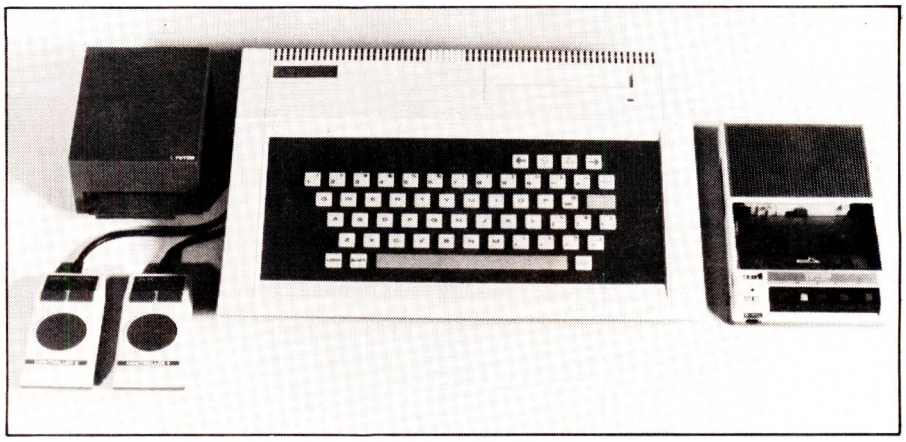
Texas Instruments on the other hand created a lot of fuss and upset many independent games software manufacturers by making it clear during the show that it intends to make use of patented circuitry in the TI 99/4A home computer. The move essentially means that only TI developed or 'TI Approved' packages will run on the machine. Apparently, the company has decided to take this step because it wants greater control over the quality and type of software that is made available on the 99/4A. One company, called Romox, didn't get too upset, however — it just announced a product that would get around the plan.

Coleco announcement

There's no doubt that the Coleco announcement was the show's most significant for the home computer market both in



The Romox Programming Terminal can store up to 500 different games.



The Tomy Tutor for children has a 16-bit TI 9995 chip.

terms of prices and the type of equipment which consumers will expect to get for their money.

To understand why, we have to take a closer look at what Coleco intends to offer with the Adam system. As indicated above, the Adam system uses the 8-bit Z80A micro as the main CPU, but it does have another three processors lurking around. In addition to the Z80A, the system unit has one other processor (presumably handling the mass storage tape drives), the keyboard has one, and the daisy-wheel printer has one as well. Coleco is not saying whose chips they are, and it probably doesn't really matter. It's clear that Coleco decided on this arrangement of processors so that the main Z80 chip could delegate the responsibility for tasks; the printer processor can accept and control all printing jobs by itself after the initial data is transferred from disk or main memory; both the keyboard and the mass storage drives tell the Z80A CPU when they have some data, rather than the Z80A constantly polling all peripherals to see if something needs attention. Coleco has given the name 'Adam-Net' to the method by which the CPU and peripherals communicate.

One technical aspect of the Adam system which attracted a lot of attention is the so-called mass storage or digital data pack drives which provide data storage/loading facilities. Originally, it was announced that the Adam would have 'wafer tape' or 'stringy floppy' drives, but on the demonstration machines at Coleco's press conference, the actual drives had much in common with ordinary audio cassette decks. There was a flip-down door which allowed you to slip in the data pack itself; this data pack could be described as a 'ruggedised' audio cassette since its casing was made up of some lightweight alloy, and the actual reel hubs which engage with the drive spindles were of substantial design (the photographs show a different drive arrangement).

The reason for all this strength becomes clear once you know that the data pack to main memory transfer rate is said to be 19.2k baud, a respectable speed when compared to floppy disk drives, and one which must put quite a bit of stress on the data pack materials. The standard Adam system comes with one digital data pack drive, which will hold between 250k to 500k depending on the density of the code being stored. Ideally, a second digital drive should be added and this will be available for about $150. The data packs will cost under $10.

In the memory department, the Adam system starts off with 80k RAM as standard, but this can be increased to 144k with an optional 64k add-on board. This gives the user quite a lot of memory to play around in, which may be necessary if Coleco follows through on some promises.

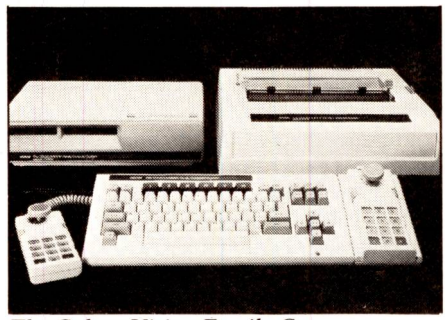
For example, the Adam system is supposed to be both Applesoft code and CP/M compatible. Negotiations are taking place with various companies with regard to getting CP/M programs onto the machine. Such programs will probably be first available on digital data packs, and later via a Coleco-label floppy disk drive. This drive will be released very late this year or early next year at a cost of about $300.

As far as Applesoft Basic programs are concerned, Coleco is being very careful, and will only indicate that if you write a program on an Apple using that particular Basic, will you be able to type that code into the Adam when running the Smart Basic digital data pack and have it run as it would on the Apple machine.

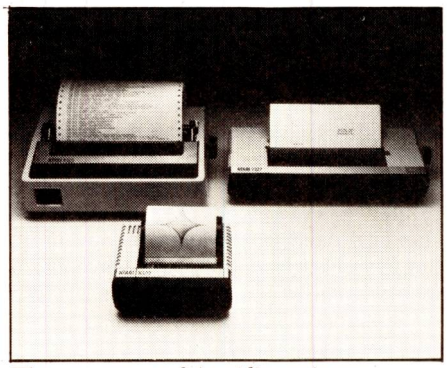
Coleco is also providing a ROM-based word processing package, called SmartWriter, keyboard function keys, and a daisy-wheel printer.

From the demonstrations performed during the Coleco press conference (held at Chicago's Art Institute) and at the company's extravagant Consumer Electronic Show stand, it is very hard to form any definite opinions about the Adam system. SmartWriter, or at least a few parts of it, were readily shown to all who asked —up to a point. It was possible to see how some of the six functions keys on the Adam keyboard were used to select word processing modes from on-screen menus, but it wasn't possible to see enough to make a critical judgement. Document margins could be altered at will, but no word or phrase 'searches' could be accomplished.

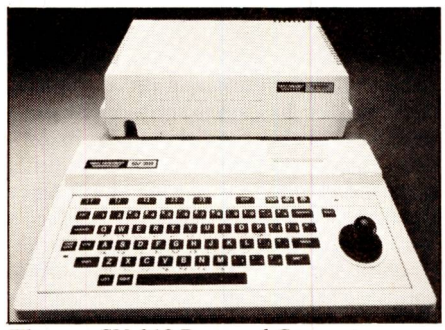
Coleco claims that Adam software is integrated, but only SmartWriter was to be seen, and only in the limited way described above. The joystick cursor control, in-



The Coleco Vision Family Computer System with memory console, Smart Writer and Keyboard.

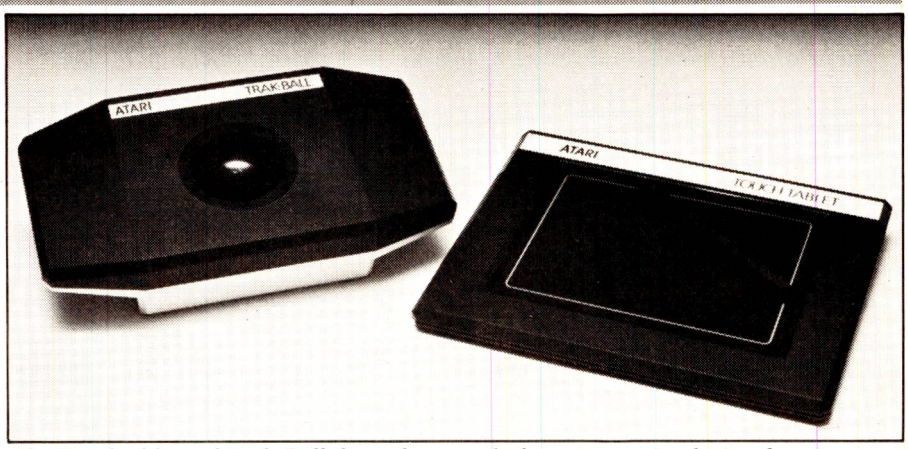


The new range of Atari line printers.

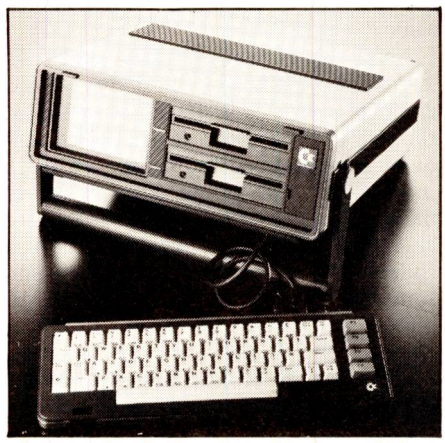


The new SV-318 Personal Computer System from Spectra Video can interface with seven additional input-output devices simultaneously.

CHICAGO IS...



The Touchtablet and Trak-Ball shown here are the latest interactive devices from Atari.



Commodore's Executive 64 uses a 6510 CPU and has Basic stored in ROM.

MY KIND OF SHOW...

tended to be used instead of a mouse, was never demonstrated in detail. In fact, one of the on-screen menu options still indicated that files were being stored on 'wafer-tape' drives instead of the digital data packs. There were many other facilities that could not be demonstrated (the effect of pressing the 'UNDO' key was never shown). This, combined with the fact that the machines at the Adam press conference had I/O ports and other bits and pieces glued down so that no one could even get a quick look at them, suggests that Coleco still has a lot of work to do before shipments begin (planned for this month).

It would really have been an event if Coleco had been able to back up just a few more of its claims — software integration, CP/M compatibility, 'Undo' last command, multi-tasking — at the show, rather than just saying 'we can do it, but not on this demonstration machine', or 'we don't have that yet, but maybe later this year'. But everyone wants Coleco to succeed, and the company has stunned a lot of competitors with its innovative digital disk packs and printer.

Output from the Adam daisy-wheel printer is very good since a range of standard daisy printwheels can be used, but if you're expecting to produce documents rapidly, forget it. The printer operates at only 10 characters per second, which is fine if you're printing a two-page letter, but will be a real pain when used for a 3000 word manuscript.

Unlike the conventional daisy-wheel printers on the market, which utilise all sorts of servo-motors and drive mechanisms, Coleco has apparently opted for a simple 'stepper-motor' design for its product. Instead of being whizzed around at high speed under the control of fancy electromechanics/software, Coleco's print-wheel is driven to discrete, degree-by-degree movements. This old faithful approach is probably more than adequate for the average home computer. There are suggestions that Coleco may be able to push the print speed up from 10cps to 30 or 40cps; if it does, it will have to pay more attention to the noise the printer makes while it is working.

A more quiet rival is the new Atari 1027 'barrel' printer which operates at 20 characters per second. It is about one-third the size of the Coleco device and is very quiet in operation. Rather than using a print-wheel, this printer uses a set of narrow rollers which have the print characters on their outside faces. The rollers are all rotated at once, and somehow the print mechanism is able to impact the correct character, from the correct roller, onto the paper surface. Surprisingly, the printer does not use ink or carbon ribbons. Instead, it features a spongy ink roller which transfers ink to the character faces in John Bull printing kit fashion. Unfortunately, it is priced at $349.95 and can only produce one typestyle (Prestige Elite 12).

Commodore range

Commodore's presence at the show was very noticeable, partly because of the company's large stand and shuttle service to the Commodore Clipper — a rented boat moored just a few miles away from the main exhibition hall — but mainly because it had so many new things on offer.

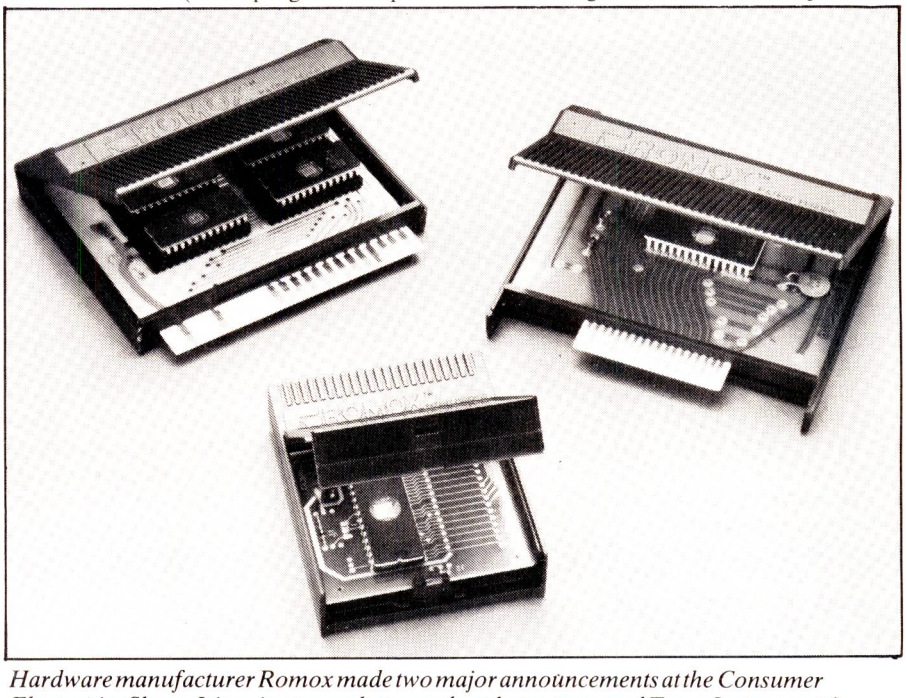
Fuelling the home/personal computer price war, Commodore announced large price reductions on its machines: software trade prices were cut by up to 50 per cent; hardware trade prices were cut by up to 25 per cent.

The portable Executive 64 machine, coming in under the $1000 mark by just $5, uses a 6510 CPU (this is program compatible with the 6502) and has Basic stored in ROM. It can run a wide range of programming languages in addition to Basic, including Pascal, Comal, Logo, Pilot and Assembler. The main hardware features are that it weighs 27.6 pounds, has 64k RAM, full upper/lower case display and keyboard, an integral six-inch colour display, and one floppy disk drive with only a 170k storage capacity with the option of adding another drive later. It is very compact, measuring 14½ × 14½ × five inches.

By buying an add-on Z80 cartridge, the Executive 64 can be turned into a CP/M machine or, with a PET Emulator, a PET. Also, the Executive 64 can make use of VIC-20 and Commodore 64 peripherals.

Since Apple's Lisa became widely known, there has been a flurry of announcements regarding similar projects, packages and concepts. Commodore (which has a licence to use the Xerox-developed Smalltalk system), has made a first attempt at producing software that allows a user to enter commands by manipulating visual representations of everyday objects. It is called Magic Desk and runs on the Commodore 64.

With Magic Desk, the user is provided



Hardware manufacturer Romox made two major announcements at the Consumer Electronics Show. It is going to market a product that gets around Texas Instruments' plans to modify the TI99/4A so that it will accept only TI approved games cartridges. And it will soon launch a juke-box like terminal that will allow retailers to program and reprogram special games cartridges.

The first product is called GamePort. It plugs into the TI99/4A I/O port, and so can communicate directly with the machine's 9900 central processor. In this way, Romox says, users can avoid the consequences of the TI circuit modification. GamePort will play any standard ROM cartridge and it also includes an extra 8k of ROM to expand the TI99/4A's capabilities. There are plans to include some RAM memory as well, but Romox has not yet decided how much should be included. GamePort will cost $39.95 and will be available later this year.

The company's second product is designed for retail stores that already sell games software cartridges. Instead of stocking a large number of the relevant cartridges, the new terminal allows retailers to maintain a central base of up to 500 games which can be copied any number of times onto what Romox is calling the Edge Connector Programmable Cartridge.

This cartridge is simply inserted in the games terminal and the software is downloaded into it. Once you get tired of a particular game you just take the cartridge back and reload another game over the first (the same way audio cassettes can be used for one recording then erased).

Romox plans to lease the terminal to retail stores for about $100 per month.

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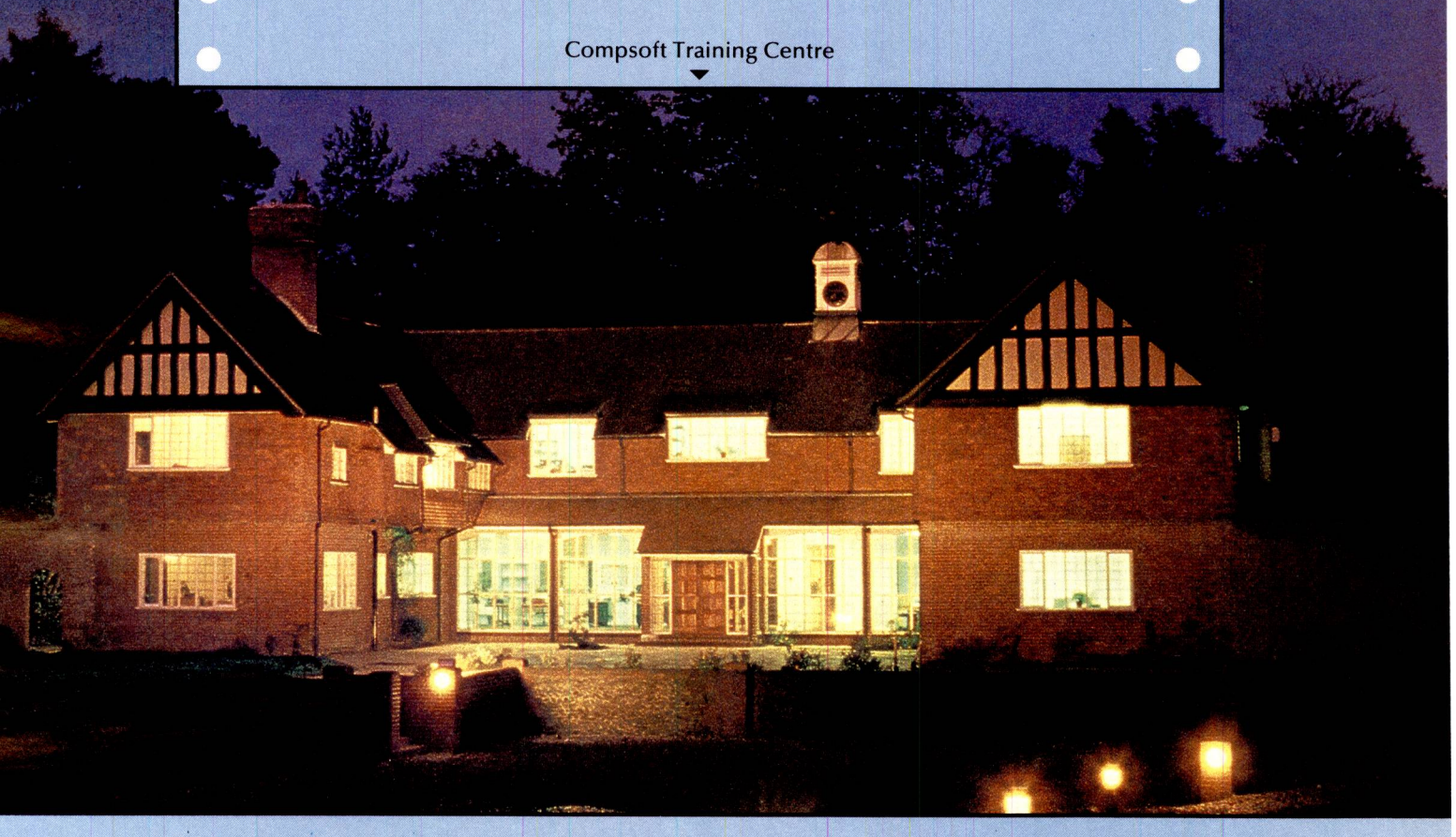

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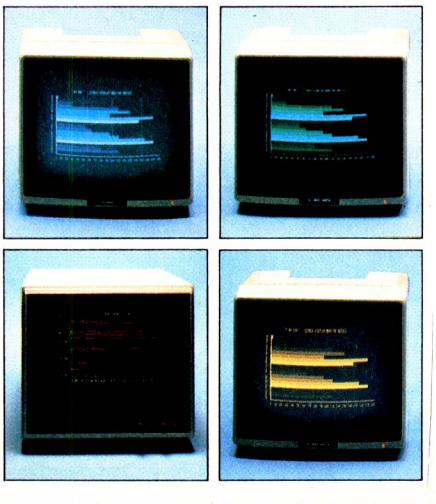

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with a graphic representation — in arcade quality resolution — of an office. In the centre of the screen there is a desk with a collection of familiar objects arranged on top: a typewriter (word processing or text editing); a calculator and financial journal (for calculating and simple spreadsheet facilities; a card file (for storing lists of names and addresses); and a telephone (Commodore wouldn't comment on what the telephone represented since it couldn't be demonstrated, but it doesn't take much imagination to figure that one out). Under the desk is a wastebasket, which is used to discard unwanted files. To the right of the desk is a filing cabinet with a digital clock resting on top of it, and to the left is an artist's easel.

Like the telephone, the artist's easel is not yet available for use, but it will presumably be used to access some kind of drawing system. The filing cabinet, on the other hand, is a key metaphor of the Magic Desk environment since it is where all files will be saved to or retrieved from. The cabinet has three drawers, each of which contains ten file folders. Each of these folders contains ten pages for document storage. It's not clear how much information can be stored per page.

Instead of a conventional cursor, users of Magic Desk move a disembodied arm, complete with pointing finger, to select any of the office objects, or metaphors. If you want to open a file cabinet drawer, for example, you would use a joystick, mouse, trak-ball, or any other cursor controller to first point at the relevant drawer with the hand. You would then press the controller's 'select' or 'fire' button to execute the 'open file-drawer' command, and then move onto finding a particular file and updating it in some way.

Magic Desk does not presently feature windows as on the Xerox Star, Apple Lisa, or even those simple bordered split screens available with Microsoft's Multiplan. Instead, whenever a new activity is selected, the whole screen display is updated. Magic Desk has little of the sophistication of the Star and Lisa, but yet it shows the kind of effort being made at the home computer software market level. It is simple to use, can be immediately understood by a user regardless of his or her native language, and the on-screen metaphors can be customised more or less at will. Magic Desk I, as this first system is being called, will be available later this year in ROM cartridge form for less than $100. A second cartridge, to handle calculating and home applications, is also on the way.

Atari attack

With the announcement of four new machines (all based on the 6502C chip running at 1.79MHz) and a range of new peripherals, Atari is hoping to quiet much of the criticism it has been receiving in the last year or so.

The smallest of the new entrants, the 600XL, comes with 16k RAM and 24k ROM as standard, although the RAM can be pushed up to 64k with an optional Memory Module expansion unit. A useful addition is the 'Help' key, placed to the right of the keyboard along with other special function keys. If the user encounters some difficulty in proceeding with a task, pressing the Help key will usually summon up useful instructions. This feature is common to all of the new machines, as is the ability to generate 256 colours, to emit all sorts of sounds, and to carry out self-test diagnostics.



Following the unsuccessful launch of the Aquarius home computer last autumn its maker Mattel Electronics produced a re-vamped model, the Aquarius II, at the show.

It includes full-stroke keyboard, 12k ROM, 64k RAM, a Z80A processor and it runs Microsoft Basic with 16 colours.

Back-up marketing includes the Aquarius COM/PAC package containing the basic unit with hand controllers for game-playing, a 40 column thermal printer and a cassette recorder.

In addition, the 800XL has 64k as standard; the 1400XL has 64k RAM, four programmable keys, a built-in modem, and a speech synthesiser. The 1450XLD includes all of this, plus an integral double-sided, dual-density disk drive.

Only the 600XL has been given a price — $199. Atari has yet to make up its mind about the three others.

As a result of the new Atari CP/M plug-in module, produced by California company, Add-On Software, all Atari computers can now run CP/M version 2.2 programs. The module features a four MHz Z80 micro with 64k RAM and it connects to the various machines via the serial I/O port. While this is a fairly simple approach, there is a penalty to pay as far as program execution speed is concerned because the Z80 and 6502C chips can only communicate at the standard I/O port speed rather than at system bus speed. No price has been set.

Conclusions

In the midst of all this jockeying for position by the major competitors, it would be easy to miss some interesting advances made by less conspicuous companies. It would be easy to miss the system with a 10.7 MHz chip, called Tomy Tutor, which has been designed for younger children. It comes with a peanut-butter proof (rather than ergonomic) keyboard, and can *really* handle animated graphics. Standard memory is 32k ROM and 16k RAM, expandable up to 64k. Interested parents/children can obtain the machine on a 'five day free home trial' basis.

Just a short time ago, a company called Spectravideo would have made quite a splash with its two microsystems — the SV-318 and the SV-328. Both machines are based on the Z80A, and can handle up to 256k RAM and 96k ROM. The SV-318 comes with built-in joystick cursor controller, special word processing keys, 32 graphic sprites, ten user definable keys and CP/M compatibility for under $300. The SV-328 is designed more for business use and, in addition to most of the SV-318 features, comes with Basic, word processing, a 'Super Terminal' program and a 'Help' program stored in ROM. The SV-328 costs $595.

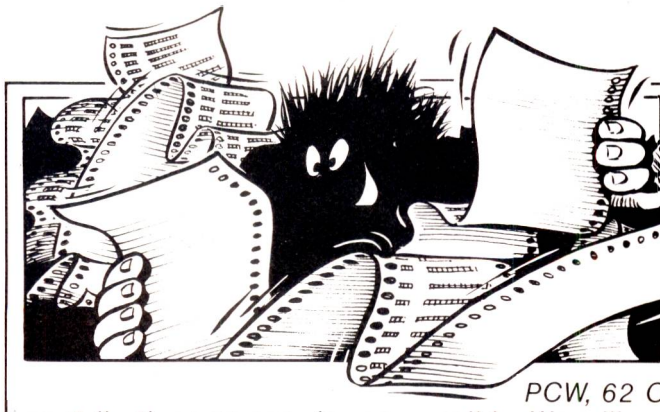
With Commodore, Coleco and Atari engaged in an all-out battle for the home computer market, we'll obviously have to look that bit harder so as not to miss significant breakthroughs by the smaller companies.

Overheard at the show

Apple's Mackintosh will probably be offered with TK! Solver, the high powerful calculating tool from Software Arts.

The Mackintosh is a low cost personal computer which will be a cut-down version of Lisa running similar applications and incorporating a mouse, although not the icons. It was named after a breed of the edible apple in the US, the McIntosh.

END



TJ's Workshop

Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to 'TJ's Workshop', PCW, 62 Oxford Street, London W1A 2HG. Please keep your contributions as concise as possible. We will pay £5-£30 for any tips we publish. PCW can accept no responsibility for any damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.

NASCOM GRAPHICS LIST

Nascom Basic is an 8080 version of Microsoft's standard 8k tape Basic. When it was patched onto the Nascom, someone overlooked the fact that the LIST command detokenised all characters over 7FH into keywords, even if they were within inverted commas or part of a REM statement. For example;

10 PRINT"/"

would LIST as ;

10 PRINT"GOTO"

This means that lines containing graphics cannot be edited. To overcome this, I wrote the following routine. After initialisation by DOKE 4100, Location of routine

A=USR(O)

all characters are routed through the program before appearing on the screen. If the character happens to be a" then the routine tests to see if a Basic program is being LISTed. To do this, it uses the fact that BC is conveniently set to 1022H while LISTing takes place, but not at other times. If a Basic program is being LISTed, then the program disables the NAS-SYS user output routine by setting the jump vector to point to a RET (C9H) at 002FH. (This prevents the program looping indefinitely when a" is printed.) Next, the routine retrieves the position reached by LIST within the Basic program. This happens to be placed 24 locations up the stack. To get at it, HL is loaded with 24 and then SP is added to HL. BC is then loaded with the value pointed to by HL, ie. LD BC, (HL) However, no such instruction exists, so lines 490—520 perform the task. This done, the routine prints a" and then all following characters until either another" or the end of the line (00) is reached. The routine then replaces the new position in the Basic program and re-enables the NAS-SYS user output routine, before returning to NAS-SYS.

The routine is very useful when writing a Basic program which contains graphics, making editing much faster. The program was written using ZEAP 2. 1

Quentin King

```
ZEAP Z80 Assembler - Source Listing

                0010 ; ************************************
                0020 ; *** NASCOM BASIC 'LIST' ROUTINE ***
                0030 ; ***        By Quentin King        ***
                0040 ; ************************************

0C80            0060         ORG   £0C80 ; 3200 decimal

0C80 0C78       0080 UOUT    EQU   £0C78 ; NAS-SYS output routine
0C80 0022       0090 QUOTE   EQU   £22   ; ASCII for "

                0110 ; ***************************
                0120 ; *** Initialise routine ***
                0130 ; ***************************

0C80 21890C     0150         LD    HL,TEST
0C83 22780C     0160         LD    (UOUT),HL
0C86 DF55       0170         SCAL  "U
0C88 C9         0180         RET

                0200 ; ***************************
                0210 ; *** Test each character ***
                0220 ; ***************************

0C89 FE22       0240 TEST    CP    QUOTE
0C8B 2031       0250         JR    NZ,END3

                0270 ; Character is a " so test to
                0280 ; see if list is in progress.

0C8D E5         0300         PUSH HL
0C8E C5         0310         PUSH BC
0C8F 212210     0320         LD    HL,£1022
0C92 B7         0330         OR    A
0C93 ED42       0340         SBC   HL,BC
0C95 2025       0350         JR    NZ,END2

                0370 ; List is in progress. First, disable
                0380 ; NAS-SYS output routine...

0C97 212F00     0400         LD    HL,£002F
0C9A 22780C     0410         LD    (UOUT),HL

                0430 ; ...then find position in Basic program.

0C9D 211800     0450         LD    HL,24
0CA0 39         0460         ADD   HL,SP
0CA1 E5         0470         PUSH HL

0CA2 7E         0490         LD    A,(HL)     ;
0CA3 23         0500         INC   HL         ;
0CA4 46         0510         LD    B,(HL)     ; = LD BC,(HL)
0CA5 4F         0520         LD    C,A        ;
                0540 ; BC now points to the character following
                0550 ; the " in the Basic program. So, print
                0560 ; a " then print all following characters
                0570 ; until either another " or the end of
                0580 ; line (00) is reached.

0CA6 3E22       0600         LD    A,QUOTE
0CA8 F7         0610 LOOP    RST   £30
0CA9 0A         0620         LD    A,(BC)
0CAA B7         0630         OR    A
0CAB 2805       0640         JR    Z,END1
0CAD 03         0650         INC   BC
0CAE FE22       0660         CP    QUOTE
0CB0 20F6       0670         JR    NZ,LOOP

                0690 ; Printing complete. First, replace
                0700 ; new position in Basic...

0CB2 E1         0720 END1    POP   HL
0CB3 71         0730         LD    (HL),C
0CB4 23         0740         INC   HL
0CB5 70         0750         LD    (HL),B

                0770 ; ...then re-enable the NAS-SYS output
                0780 ; routine.

0CB6 21890C     0800         LD    HL,TEST
0CB9 22780C     0810         LD    (UOUT),HL

                0830 ; Finally, restore BC and HL, clear
                0840 ; the carry flag and return to NAS-SYS.

0CBC C1         0860 END2    POP   BC
0CBD E1         0870         POP   HL
0CBE B7         0880 END3    OR    A
0CBF C9         0890         RET
```

MORE WRAPAROUND

Mr Nix's routine 'BBC Wraparound' published in the May edition of *PCW*, uses three REPEAT-UNTIL loops to give wraparound when printing strings. The routine below is faster and more concise because it uses the INSTR function to find spaces between words. The routine ensures that A$ is never empty, and so avoids the bug associated with INSTR.

```
2000  DEFPROCPRINT (A$)
2010  LOCAL L%
2020  A$=A$+" "
2030  REPEAT
2040    L%=INSTR (A$," ")
2050    IF POS+L%>38
        THEN PRINT
2060    PRINT LEFT
        $(A$,L%);
2070    A$=MID$(A$,L%+1)
2080    UNTIL LEN(A$)<2
2090  PRINT
3000  ENDPROC
```

The following modifications allow the string to be printed in colour in MODE 7:

2010 LOCAL L%: PRINT CHR$ (129);: REM teletext red

2050 IF POS+L%>38 THEN PRINT 'CHR$ (129);

I have used this routine in interactive text games, where a well formatted but speedy reply is important.

Bill Walker



PET FUNCTION KEY

This is a routine which creates a definable function key. The stored function is printed by pressing shift and space together. Any string can be printed including those containing cursor movements. For example, the combination of ASCII characters 147,76,201,13 would clear the screen and list the program in RAM

It is necessary to specify the length of the desired string before entering it into the computer. The length is the number of ASCII characters used, so the above example has a length of 4.

What the program does is to check first if the keys are pressed, then insert the string into the keyboard buffer.

The start address of the program is input in the program.

Note: In the listing the characters ↓, ↑, ← and → are the cursor controls DOWN, UP, LEFT and RIGHT respectively.

Chris Patmore

```
10 PRINT"(CLR ++++ RVS ON) FUNCTION KEY FOR NEW ROM PET.
20 INPUT"AT WHAT DECIMAL POSITION IN RAM DO YOU  WANT THE ROUTINE";D
25 PRINT"(++)
30 IFD(828THENPRINT"THAT WOULD NOT BE WISE.":GOTO20
40 P=PEEK(53)*256+PEEK(52)
50 IFD)P-60THENPRINT"YOU HAVE NOT GOT ENOUGH MEMORY TO PUT ITTHERE.":GOTO20
60 IFPEEK(47)*256+PEEK(46))D-20THENPRINT"THAT'S A BIT CLOSE TO THE END OF THIS
70 IFPEEK(47)*256+PEEK(46))D-20THENPRINT"PROGRAM. CHOOSE AGAIN":GOTO20
80 R=D:D%=D/256:D=D-D%*256
90 PRINT"(CLR ++)TURN ON WITH :-
100 PRINT"(+) POKE144,"D":Po145,"D%
110 PRINT"(++) TURN OFF WITH :-
120 PRINT"(+) POKE144,46:Po145,230
130 PRINT"  OR BY USING THE TAPE DECKS."
140 PRINT"(+) PRESS SHIFT & SPACE SIMULTANIUSLY
150 PRINT"TO PRINT A PRE-DEFINED STRING.
160 PRINT"(+) N.B.":PRINT"====":PRINT"IT CAN CONTAIN CURSOR CONTROL CHARACTERS"
170 POKE158,0
180 FORI=1TO2000:GETA$:IFA$=""THENNEXT
190 INPUT"(CLR) LENGTH OF STRING (1-9)";L
200 POKER+33,L:POKER+37,L
210 FORI=1TOL:PRINT"ASCII VALUE OF CHAR."I;:INPUTA:POKER+47+I,A:NEXT
220 PRINT"(CLR ++++++ ++++++) POKING MACHINE CODE."
230 FORI=0TO47:READX:POKER+I,X:NEXT
240 Q=R+48:Q%=Q/256:Q=Q-Q%*256
250 POKER+26,Q:POKER+27,Q%
260 POKER+33,L:POKER+37,L
270 PRINT"(+++) SWITCHING ON
280 POKE144,D:POKE145,D%:PRINT"(++) ON."
290 END
300 DATA165,151,201,6,240,5,133,255,76,46,230,165,255,201,6,240,247
310 DATA165,152,201,1,208,241,160,0,185,106,3,153,111,2,200,192,9,208
320 DATA245,169,9,133,158,169,6,133,255,76,46,230,0
```

ORIC KEYBOARD TOGGLES

The Oric has some facilities for accessing features directly from the keyboard, mainly via the CTRL key.

This method has a distinct disadvantage when used inside a program. You do not know whether the feature is currently switched on or off when you toggle the features with a 'PRINT CHR$(x)'.

In the demonstration programs supplied with the Oric, you will notice a line 'POKE # 26A, 10' (#26A is 618 in decimal). You will also notice that the beep from the keyboard has been switched off and that there is no flashing cursor, no matter whether it was switched on or off when you started the program.

Location 618 is one of those marked down as 'run time variables' in the memory map given in the manual. As well as controlling the key beep and the flashing cursor, it controls several other things as follows:

b_0—value 1—controls flashing cursor—CTRL Q. 0 off, 1 on

b_1—value 2—controls screen on/off—CTRL S. 0 off, 1 on

b_2—value 4—controls copy output to printer—CTRL P. 0 off, 1 on

b_3—value 8—controls key beep—CTRL F. 0 on, 1 off

b_4—value 16—take next character as attribute—ESC. 0 off, 1 on

(This one switches off after a character has been typed in or PRINTed.)

b_5—value 32—controls reserved column—CTRL. 0 on, 1 off

(This has the advantage that it can be used when still in TEXT mode.)

b_6—value 64—controls the auto double height—CTRL D. 0 off, 1 on

b_7—value 128—controls caps lock—CTRL T. 0 off, 1 on.

(This is b_7 of &20C (524 decimal), not &26A.)

To use this feature, decide which facilities you want on and off and multiply the on/off number by the value shown above for 6.

For example, you might want the following toggle combination:

no flashing cursor ($b_0 = 0$)
the screen on ($b_1 = 1$)
no copy to printer ($b_2 = 0$)
no key beep ($b_3 = 1$)
full forty column screen ($b_5 = 1$)
but no auto double height ($b_6 = 0$)

You then calculate $(0 \times 1) + (1 \times 2) + (0 \times 4) + (1 \times 8) + (0 \times 16) + (1 \times 32) + (0 \times 64) = 42$.

Enter 'POKE 618, 42' and the toggles are all set.

Gordon R Love

TRS-80 HEX

TRS-80 users without disks will often have needed a convenient method of entering hexadecimal numbers in a Basic program, especially for PEEKing and POKEing. In Disk Basic (Level III) this is achieved by preceding the number with &H, eg, &HAA gives 170 decimal. The Basic program given below loads a machine code routine into 4040H (not used by Level II), which is called whenever an & is encountered. The program converts a following hexadecimal number into its decimal equivalent which is passed to the Basic interpreter. If more than four hex digits follow the &, only the last four are evaluated. No H is required, eg, PRINT &1001 prints 4097; POKE &4000, &FF pokes 255 into location 16384.

```
 10 RESTORE
 20 READ N
 30 IF N=999 THEN END
 40 IF N>255 THEN A=N:
    READ N ELSE A=A+1
 50 POKE A,N
 60 GOTO 20
 70 DATA 16789,64,64
 80 DATA 16448,197,213,
    17,0,0,35,126,214,48,
    56,39,254,10,56,
    10,254,17,56,31,
    254,23,48
 90 DATA 27,214,7,71,122,
    135,135,135,135,87,
    123,7,7,7,7,95,
    230,15,178,87,62,
    240,163,176
100 0,95,24,211,237,83,
    33,65,229,33,175,64,
    54,2,225,209,193,
    201,999
```

A W Sheppard

LOUDER BEEP

To make a decent amplifier for the quiet sound of the Spectrum all you need is a tape recorder and the leads supplied with your Spectrum.

Connect one end to the EAR socket on the Spectrum and the other end to the MIC socket on your cassette recorder. Start the tape recorder playing (with no tape in) and any BEEPs will be amplified.

Tony Bell



TRS-80 FILE COPIER

Owners of the TRS-80 with only one disk drive may be interested in the following program.

A limitation of TRS-DOS is that it does not allow copying of disk files between disks with only one drive.

My program overcomes this limitation by copying the entire file to memory, then copying the file, now resident in memory, to the other disk. This assumes that the available memory is sufficient for this purpose, but even with the minimum system of 32k there would not be many cases where this would not be so.

The program makes extensive use of the routines that exist in TRS-DOS. It prompts the user to change disks when necessary.

The syntax is the same as the COPY command in TRS-DOS, ie, COPY FILENAME TO FILENAME. Unfortunately the word COPY is not available. A different program name will have to be used, maybe TRANSFER.

L Brooks

```
5200            00050           ORG 5200H
5200 11E752     00060 START     LD DE,BUFFIN ;FIRST DCB
5203 CD1C44     00070           CALL 441CH   ;GET 1ST. FILESPEC
5206 C28A52     00080           JP NZ,ERR1   ;JUMP IF NO FILESPEC
5209 110753     00090           LD DE,BUFOUT ;2ND. DCB
520C CD1C44     00100           CALL 441CH   ;GET 2ND. FILESPEC
520F C28A52     00110           JP NZ,ERR1   ;JUMP IF NO FILESPEC
                00120 ;DISPLAY "INSERT SOURCE DISK <ENTER>"
5212 21AC52     00130           LD HL,SRCMES ;MESSAGE ADDRESS
5215 CD6744     00140           CALL 4467H   ;DISPLAY MESSAGE
                00150 ;WAIT FOR <ENTER>
5218 CD4900     00160 KB1       CALL 49H     ;KEYBOARD
521B FE0D       00170           CP 0DH
521D 20F9       00180           JR NZ,KB1    ;JUMP IF NOT CR
                00190 ;READ SOURCE FILE
521F 0600       00200           LD B,0       ;LRL
5221 11E752     00210           LD DE,BUFFIN ;SOURCE DCB
5224 215953     00220           LD HL,BUFFER ;SECTOR BUFFER
5227 CD2444     00230           CALL 4424H   ;OPEN SOURCE FILE


522A C29352     00240           JP NZ,ERR2   ;JUMP IF ERROR DURING OPEN
522D 015954     00260           LD BC,MEMORY ;TEMPORARY STORE
5230 11E752     00270 READ      LD DE,BUFFIN ;SECTOR BUFFER
5233 CD1300     00280           CALL 13H     ;GET A BYTE FROM
                00290                        ;SOURCE FILE
5236 2004       00300           JR NZ,ERR4   ;JUMP IF READ ERROR
5238 02         00310           LD (BC),A    ;STORE BYTE IN MEMORY
5239 03         00320           INC BC
523A 18F4       00330           JR READ
523C FE1C       00340 ERR4      CP 1CH       ;TEST FOR EOF
523E 2802       00350           JR Z,RITIT   ;GO IF DONE
5240 1851       00360           JR ERR2      ;JUMP IF SOME OTHER ERROR
                00380 ;THE ENTIRE FILE NOW STORED IN MEMORY
                00390 ;ADEQUATE MEMORY ASSUMED
5242 ED432753   00400 RITIT     LD (CONTA),BC ;STORE HIGHEST
                00410                         ;MEMORY ADDRESS
5246 11E752     00420           LD DE,BUFFIN  ;SOURCE DCB
5249 CD2844     00430           CALL 4428H ;CLOSE SOURCE FILE
524C 2045       00440           JR NZ,ERR2    ;JUMP IF ERROR DURING CLOSE
                00460 ;DISPLAY "INSERT DESTINATION DISK <ENTER>
524E 21C752     00470           LD HL,DESMES ;MESSAGE ADDRESS
5251 CD6744     00480           CALL 4467H   ;DISPLAY MESSAGE
                00490 ;WAIT FOR ENTER
5254 CD4900     00500 KB2       CALL 49H     ;KEYBOARD
5257 FE0D       00510           CP 0DH
5259 20F9       00520           JR NZ,KB2
                00530 ;OPEN DESTINATION FILE
525B 0600       00540           LD B,0
525D 110753     00550           LD DE,BUFOUT ;DESTINATION DCB
5260 215953     00560           LD HL,BUFFER ;SECTOR BUFFER
5263 CD2044     00570           CALL 4420H   ;INIT CALL
5266 202B       00580           JR NZ,ERR2   ;JUMP IF ERROR
                00590                        ;DURING INIT
                00600 ;TRANSFER DATA TO DESTINATION FILE
5268 015954     00610           LD BC,MEMORY
526B 0A         00620 WRITE     LD A,(BC)
526C 110753     00630           LD DE,BUFOUT
526F CD1B00     00640           CALL 1BH     ;WRITE BYTE TO DISK
5272 201F       00650           JR NZ,ERR2
5274 2A2753     00660           LD HL,(CONTA)
5277 37         00670           SCF
5278 ED42       00680           SBC HL,BC    ;COMPARE BC WITH
527A 03         00690           INC BC       ;HIGHEST MEMORY
527B 7C         00700           LD A,H
527C B5         00710           OR L
527D 20EC       00720           JR NZ,WRITE  ;JUMP IF NOT DONE
                00730 ;CLOSE DESTINATION FILE
527F 110753     00740           LD DE,BUFOUT
5282 CD2844     00750           CALL 4428H
5285 200C       00760           JR NZ,ERR2   ;JUMP IF ERROR
                00770             -          ;DURING CLOSE
5287 C32D40     00780           JP 402DH     ;DONE, GO TO TRSDOS
528A 219852     00790 ERR1      LD HL,MESS
528D CD6744     00800           CALL 4467H
5290 C33040     00810           JP 4030H
5293 F640       00820 ERR2      OR 40H       ;ADD FILE ERROR BIT
                00830                        ;TO ERROR CODE
5295 C30944     00840           JP 4409H     ;CALL SYS4 TO PRINT
                00860                        ;ERROR MESSAGE
5298 46         00900 MESS      DEFM 'FILE SPEC. REQUIRED'
5299 49
529A 4C
529B 45
529C 20
529D 53
529E 50
529F 45
52A0 43
52A1 2E
52A2 20
52A3 52
52A4 45
52A5 51
52A6 55
52A7 49
52A8 52
52A9 45
52AA 44
52AB 0D         00910           DEFB 0DH        ;MESSAGE TERMINATOR
52AC 49         00930 SRCMES    DEFM 'INSERT SOURCE DISK <ENTER>'
52AD 4E
52AE 53
52AF 45
52B0 52
52B1 54
52B2 20
52B3 53
52B4 4F
52B5 55
52B6 52
52B7 43
52B8 45
52B9 20
52BA 44
52BB 49
52BC 53
52BD 4B
52BE 20
52BF 3C
52C0 45
52C1 4E
52C2 54
52C3 45
52C4 52
52C5 3E
52C6 0D         00940           DEFB 0DH
52C7 49         00950 DESMES    DEFM 'INSERT DESTINATION DISK <ENTER>'
52C8 4E
52C9 53
52CA 45
52CB 52
52CC 54
52CD 20
52CE 44
52CF 45
52D0 53
52D1 54
52D2 49
52D3 4E
52D4 41
52D5 54
52D6 49
52D7 4F
52D8 4E
52D9 20
52DA 44
52DB 49
52DC 53
52DD 4B
52DE 20
52DF 3C
52E0 45
52E1 4E
52E2 54
52E3 45
52E4 52
52E5 3E
52E6 0D         00960           DEFB 0DH
0020            01000 BUFFIN    DEFS 32
0020            01010 BUFOUT    DEFS 32
0002            01030 CONTA     DEFS 2
0100            01040 BUFFER DEFS 256
5429 00         01050 MEMORY NOP
5200            01060           END START
00000 Total Errors
MESS    5298
WRITE   526B
KB2     5254
DESMES  52C7
CONTA   5327
RITIT   5242
ERR4    523C
READ    5230
MEMORY  5429
ERR2    5293
BUFFER  5329
KB1     5218
SRCMES  52AC
BUFOUT  5307
ERR1    528A
BUFFIN  52E7
START   5200
```

TAB TRICK AGAIN

Thank you for publishing my recent tip regarding the TAB key on the BBC Microcomputer (June *PCW*).

Since writing the article I have realised that the TAB key produces the code &09 when pressed and therefore produces a similar result to the command VDU 9 and CONTROL I, forwardspace cursor one character.

To reverse the effect of the above, one must use CONTROL H which backspaces the cursor but does not erase any onscreen character it comes across.

Philip Clayton



SORTING WITHOUT SORTING

I was particularly interested in RW Bishop's sort program on page 191 of April's *PCW* as I had been thinking along similar lines. However, I think that the modification that I am proposing not only saves on memory space and execution time, but is also a totally different approach to traditional sorting methods.

My method replaces his new sorted array with a sorted index-array which references the original unsorted data. (The program was written in PET Basic but should easily be transferable to other systems.)

It is easier to explain how the program works after showing a typical end result:—

Original data array

D$(1) = Smith
D$(2) = Jones
D$(3) = Brown
D$(4) = Bloggs
D$(5) = Andrews
D$(6) = Henderson
D$(7) = Richards
D$(8) = Allen

Sorted index-array
X(1) = 8
X(2) = 5
X(3) = 4
X(4) = 3
X(5) = 6
X(6) = 2
X(7) = 7
X(8) = 1

Index sorted list
D$(X(1)) = Allen
D$(X(2)) = Andrews
D$(X(3)) = Bloggs
D$(X(4)) = Brown
D$(X(5)) = Henderson
D$(X(6)) = Jones
D$(X(7)) = Richards
D$(X(8)) = Smith

Thus only the index array is sorted and not the original data.

I tested the program using 100 randomly generated strings of alpha-characters varying in length from five to 20 characters. Each string is compared, one at a time in line 130, with the highest string already indexed. If the latest string is the same — or of higher ASCII value — then that index array is set (line 140) and the loop continues. If the latest string is lower, the program branches to line 1000. The check is then continued downwards through the indexed list (NB *not* the list itself) and each time through this loop the index value is moved upwards (NB *not* swopped) until the position is found at which the string can be indexed into place. Operation then returns to the major loop in line 150.

```
100 TI$="000000"
110 X(1)=1
120 FORA=2TON
130 IFD$(A)<D$(X(A-1))THEN1000
140 X(A)=A
150 NEXTA
160 PRINT"TIME = ";TI$
170 END
1000 FORB=ATO2STEP-1
1010 IFD$(A)>=D$(X(B-1))THEN1040
1020 X(B)=X(B-1)
1030 NEXTB
1040 X(B)=A
1050 GOTO150
```

As well as being faster than traditional bubble sort routines and Mr Bishop's method, more dramatic savings can be made where multiple fields of data are being sorted. For example, with a typical list of name, address and telephone number which is sorted into alphabetical name order, a considerable amount of time is wasted performing string-swop operations. With my method the time taken to 'sort' is the same regardless of the number of fields of data as no re-shuffling of data occurs. If required, the data can be re-stored in sorted order by indexed listing as shown above.

Bob Sharpe

ZX SPECTRUM COMMANDS

In the manual of the ZX Spectrum it is claimed that certain commands can only be used with a microdrive. But OPEN#, PRINT#, INPUT#, INKEY#, LIST# and CLOSE# can all be used with good effect.

Firstly, to print on the lower two lines all that is needed is to replace PRINT with PRINT#0; this will redirect any output to the bottom lines. If more than 20 are used then an out of screen error is issued. AT 0,0 can be used to clear the bottom lines alone ready for new information. The bottom two lines are not scrolled themselves but if a SCROLL? prompt appears odd things may happen — it is wise to disable scrolling by POKE 23692,0.

The use of OPEN# and CLOSE# is more limited, but can be extremely useful. To start with, an explanation of syntax is necessary:
OPEN # N, F$: opens logical file N to device F$ where F$ = 'S' (screen), 'P' (printer) or 'K' keyboard. Opening an already open file does not cause an error. For non microdrive operations N must be between 0 and 8.
PRINT # N: prints to file N; printing to the keyboard appears on the bottom lines. Printing to non-existent file seems to lose the output.
INPUT # N: inputs from file N — not much use as it only works with the keyboard and Input works just as well.
INKEY$ #N: same as INPUT # N but takes one character.
CLOSE # N: closes logical file N.
LIST # N: lists to file N.

Using files, output can be sent to screen or printer using the same statements and without needing the use of complex IF statements, only one variable needs to be changed.

P Baker

SPECTRUM BITS

The AND, OR, and NOT operators in Spectrum Basic are different from their equivalents in most other micros, and do not allow bit testing and manipulation — a facility which would be useful in many applications, such as handling I/O ports. The routine shown below provides logical functions for bit handling using the Z80 logic operations. The machine code is placed into the space reserved for user-defined characters 'n' to 'u', but the routine can easily be adapted to load the code elsewhere: the 'and', 'or', and 'xor' functions each require 14 bytes of code, and 'not' requires 12 bytes. The code accesses the parameters of the functions using the address given at 23563, this being where the parameters of any currently executing FN are placed.

The functions provided are:
FN a(a,b) gives a and b
FN o(a,b) gives a or b
FN x(a,b) gives a xor b (exclusive or)
FN n(a) gives not a

The functions will only yield sensible values if each parameter is in the range 0 to 255.

```
9000 REM logic functions
9010 RESTORE 9240
9020 REM code common to and, or,
9030 REM + xor
9040 FOR a=0 TO 14
9050 READ byte
9060 POKE USR "p"+a,byte
9070 POKE USR "r"+a,byte
9080 POKE USR "t"+a, byte
9090 NEXT a
9100 REM poke in opcodes
9110 POKE USR "p"+10,160
9120 POKE USR "r"+10,176
9130 POKE USR "t"+10,168
9140 REM code for 'not'
9150 FOR a=0 TO 11
9160 READ byte
9170 POKE USR "n"+a,byte
9180 NEXT a
9190 REM FN definitions
9200 DEF FN a(a,b)=USR USR "p"
9210 DEF FN o(a,b)=USR USR "r"
9220 DEF FN x(a,b)=USR USR "t"
9230 DEF FN N(a)=USR USR "n"
9240 DATA 221,42,11,92, 221,126,4,221,70,12,0,79,6, 0,201
9250 DATA 221,42,11,92, 221,126,4,47,79,6,0,201
9260 RETURN
```

S Zara

TRS-80 MODEL 100

Dick Pountain rekindles his interest in the portable computer market with his in-depth review of Tandy's TRS-80 Model 100.



Photography by Ian McKinnell

The state of the portable computer market has been transformed beyond recognition since I last pontificated in these pages in a review of the Epson HX-20. I recently obtained a copy of the first issue of the US *Portable Computer* magazine and found listed therein over thirty models, most of which no one over here has heard of; to be sure many of them appear to be 'announce now, manufacture later' jobs.

The facilities offered are beginning to include bubble-memory, 16-bit processors and large scale LCD displays. Industry analyst Portia Isaacson now routinely includes the portable sector in her presentation of future market trends, and forecasts enormous growth potential, particularly in machines with communications ability. She identifies three groups of portable machine; briefcase size (Osborne), book size (Epson) and pocket.

All of this preamble is by way of saying that portable computing has suddenly been promoted from a fringe interest to a big business; if proof were needed then this review of a machine from Tandy — which (as Radio Shack) was, until recently, America's biggest seller of micros — should supply it.

Tandy was the first US manufacturer to enter the pocket computer market, selling a slightly modified Sharp PC1211 under its own brand name. When the Sharp PC1500 came out, that too entered the Tandy catalogue. The TRS-80 Model 100 is, however, developed solely for Tandy, with

an operating system, Basic language and built-in software by Microsoft. It sports an LCD display larger than that of any competitor, and in its US version incorporates an auto-dial modem for telephone communications.

Hardware

The Model 100 is encased in a strong ABS moulding and, at 30 × 21.5 × 5cms, is fractionally smaller than the Epson. The most striking visual feature is the display; this 40 characters by 8 line LCD display is the largest currently available on a computer of this size. It makes a big difference to the usability of such a machine for text processing, since you can see a sensible amount of text without the need for sideways scrolling. Upper and lower case characters are formed on a 7 × 5 dot matrix and are quite legible, if a little 'dotty'; in addition there are built-in graphics symbols and the facility to do pixel graphics from Basic. A thumbwheel on the right-hand side of the case allows the optimum contrast to be obtained at any viewing angle.

The right-hand side also has the sliding ON/OFF switch and a socket for a mains adaptor, which is an optional extra. The Model 100 has an auto power-off function which is under software control; it comes set to a delay of ten minutes but you can reset it from Basic using the POWER command to override it completely.

The keyboard is a full sized unit with proper typewriter pitch and good feel. There is obviously no separate numeric keypad, given the limited space, but as on the Epson a NUM lock key is provided which turns a block of alpha keys into a pad. All the keys repeat if depressed for more than a second. The keyboard layout is very well put together, with a huge fat ENTER key in the proper place, CTRL, SHIFT and ESC in the standard places and extra shifts called GRPH and CODE either side of the full-sized space bar. The GRPH key produces a variety of block graphics characters (GRPH A is a little aeroplane and GRPH Y a space invader) while CODE produces the various European accents, umlauts, etc. The character set contains 256 symbols, setting the eighth bit for the specials.

Above the main keyboard are four blocks of four function keys. The first two blocks, labelled F1 to F8, are user programmable and are also used by the built-in software. The third block contains dedicated keys labelled PASTE, LABEL, PRINT, PAUSE and BREAK. PASTE is used by the text editor; LABEL toggles a display on the bottom screen line of the labels attached to keys F1 to F8; and PRINT dumps the screen contents to a printer. It also hangs the system if a printer is not connected, but BREAK will get you out without needing to reset. PAUSE suspends execution of a Basic program and a second press restarts it. The final block contains four cursor movement keys.

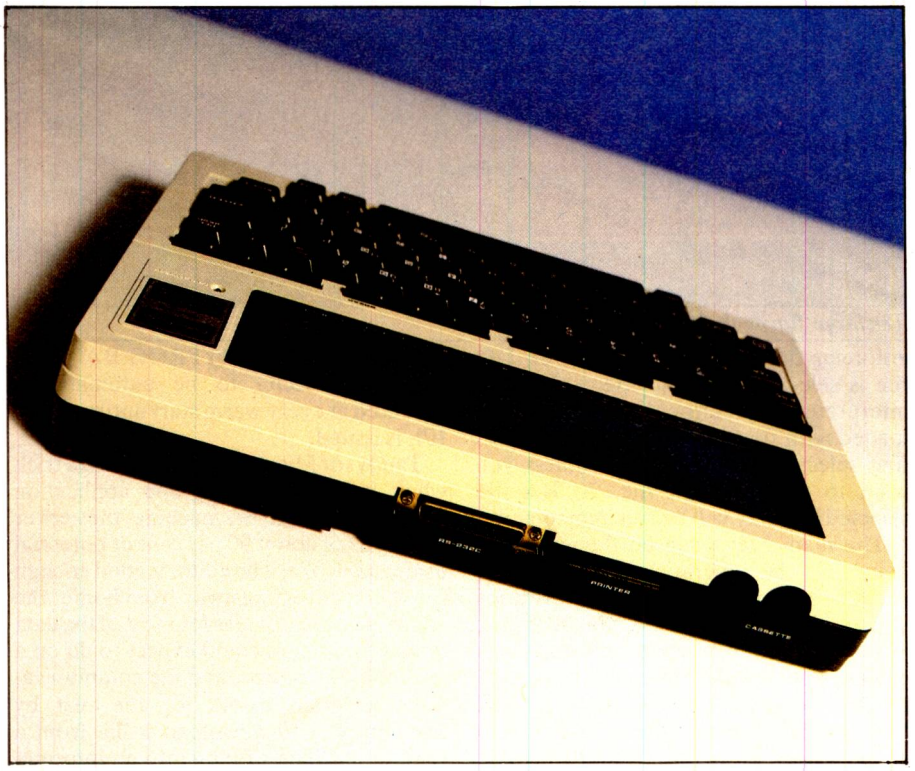
At the rear of the case is the reset button, a 27-pin D connector for the RS232 port, a Centronics compatible parallel printer port and a DIN socket for a cassette deck. Tandy recommends the use of its own line of dot-matrix or daisy-wheel printers but most parallel printers should work with a little tweaking. Most cassette recorders nowadays have mini-jack sockets including Tandy's own recommended one; if you want to use a pocket microcassette, say, you'll have to buy Tandy's DIN-to-jack cable (part no 26-1207), which costs around £2. The cassette port has remote control, and the motor can be switched on and off from a Basic program; this falls rather short of the sophistication of the Epson's software tape counter and fast-forward under program control.

Coming round to the left-hand side, there is a small connector for attaching a bar-code wand; this will make the machine popular for retail and stock-control applications. Tandy will supply the wand as an extra, along with the driver software.

There is no provision for attaching a monitor or TV set though there is a suggestive looking empty hole next to the cassette socket.

Underneath the case is a battery compartment which contains four replaceable AA size alkaline cells; approximately 20 hours' use can be had from them in normal use. These batteries do not provide the power to preserve the contents of the CMOS RAM, which is served by its own built-in Ni-Cad cell. This is automatically recharged every time you power on the computer and contains enough juice to keep 8k happy for 30 days or 32k happy for eight days, following the last power-on. This internal battery can be switched off by the Memory Power Switch on the case bottom, if you want to store the machine for long periods. Obviously all RAM contents will be lost so it will pay to be wary of this switch. A red LED low-battery indicator sits just under the company logo on the front of the machine, and lights up when you have about 20 minutes of power left.

Also on the underside is a small hatch which covers a compartment to accommodate ROM software modules, which will be available in the future; none were supplied with the test machine. Next to the ROM socket is a 40-pin DIP socket which takes all the internal bus lines to the outside world; the pin-out is given in the manual, but with minimal information as to what the signals mean.



Easily accessible sockets at the rear.

Inside

The case opens up by removing four screws and reveals a very pretty main board layout plus subsidiary boards for the keyboard and the LCD display. This latter contain no less than ten large 'flat pack' ICs whose function I failed to define, and more tracks than I have ever seen on one board; decoding large LCDs is no laughing matter.

Memory on the main board comes in the form of three 64k chips of a curious construction; each has two Toshiba 'flat pack' 32kbit chips mounted side by side on a DIP carrier. The test machine had 24k RAM but a cheaper 8k version will be sold. There is a spare socket on the board to expand either machine by a further 8k, so 32k is the largest memory available.

The CPU is an 80C85, a CMOS version of the Z80-compatible 8085, which is good news for software developers. It runs at 2.4 MHz and the Benchmark timings reflect this by being acceptably fast for a portable (apart from BM8 which is very slow).

When the Model 100 is switched on it performs a warm start; you will be placed

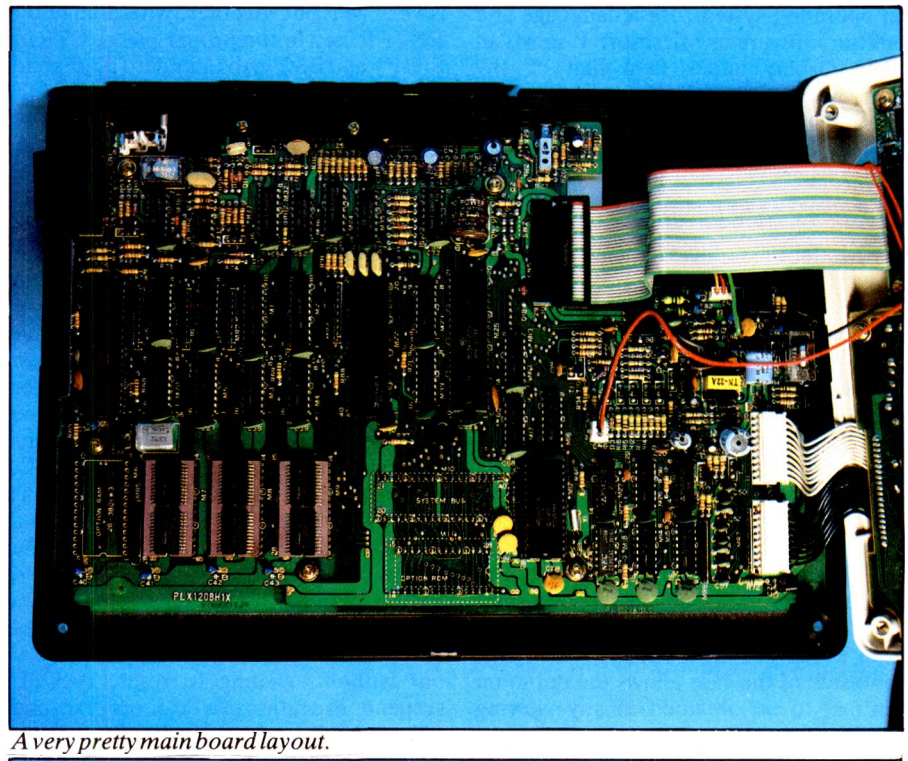
into the main menu. A cold start, which erases the contents of RAM, is performed by holding down CTRL PAUSE and switching on the power or resetting; it is only necessary following a major system change such as adding more RAM or a ROM module. RESET itself does not lose any memory contents and can be used without anxiety if you manage to hang the system which is only likely if you are messing around in machine code; BREAK always sufficed from Basic.

Software

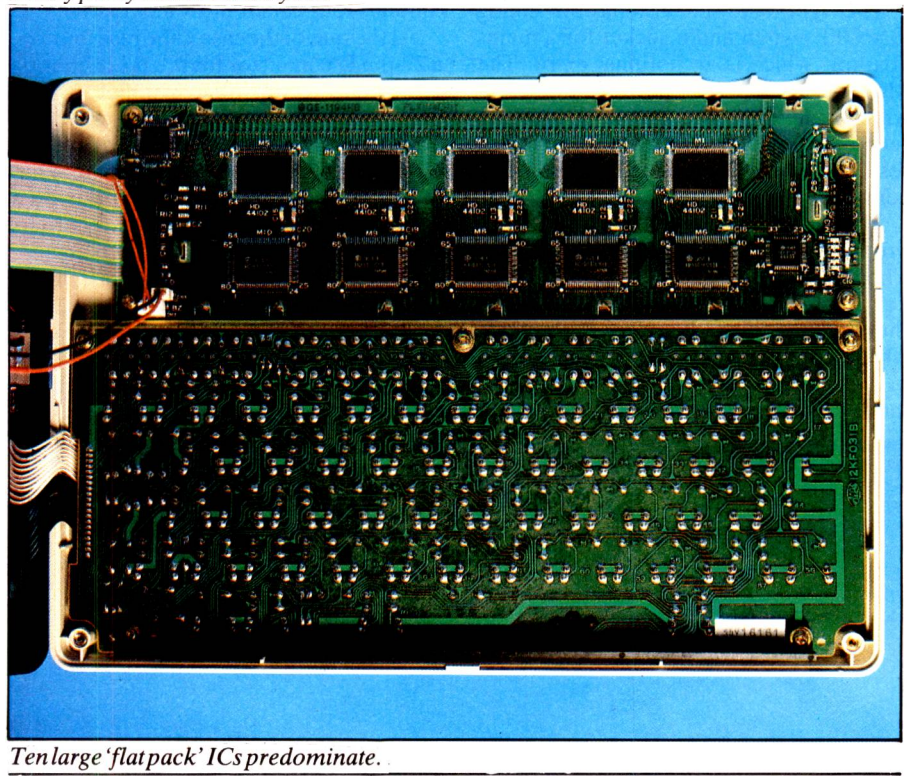
The Model 100 has a suite of operating software in ROM which was designed for the machine by Microsoft. There are four built-in application programs called TEXT, TELECOM, ADDRSS and SCHEDL (short for schedule) plus a custom version of Microsoft Basic. When the machine is turned on for the first time, these five options appear on a menu with a reversed field block cursor sitting over BASIC. The top line of the screen contains the time and date in the format '19 Jun 1983 Sun 14:40:03' which makes a refreshing change from the list of cryptic numbers offered by most machines. A choice from the menu can be made by either typing the filename on the 'select:' line at the bottom of the screen or by moving the block cursor over the name using the cursor keys and then hitting return (this excellent system was pioneered in Microsoft's Multiplan spreadsheet). At the bottom right corner is displayed the amount of free RAM.

The operating system is simple but effective. It treats RAM just like a disk with the Menu as the directory. Obviously some of RAM is used as working space when you are in one of the programs, but this is organised in a totally transparent manner so that you never need to worry about the memory partitioning; work-space does not appear on the directory, only files. The application programs all create files which are added to the directory and can be saved and loaded just as if from mass storage. Files can be redirected to other devices by adding a device name to the specification — for example, SAVE "CAS:MYPROG" would put a program onto cassette. The other devices recognised are LPT: (the printer), LCD: (the screen), COM: (the RS232 port) and RAM: which is normally omitted since it is the default.

The operating system recognises only three types of RAM file; tokenised Basic programs suffixed by .BA, documents (ie, ASCII files) suffixed by .DO and machine code files with the .CO extension. The first two suffixes are added by the Basic interpreter or the text editor automatically, so that every file you create will have one or the other; both programs reject any attempt to give a different extension. The .CO extension is automatically given to machine code files saved from Basic by the SAVEM command. Therefore, the only files without suffixes are the built-in programs, which is a reasonable way of enforcing file discipline. If a .BA or .DO file is selected from the Menu then the interpreter or editor is automatically loaded with that file; it isn't necessary to first select BASIC or TEXT unless you want to create a new file. A .BA file selected this way will be run immediately.



A very pretty main board layout.



Ten large 'flat pack' ICs predominate.

The main Menu can be thought of as being at the operating system level; pressing function key 8 ('Menu') returns you to this level from any of the programs. However, file management commands can't be issued in the Menu; you have to be in Basic to KILL (ie, delete) or NAME (change the name of) a file, or to send it to an I/O device. From Basic it is also possible to create a turnkey program using the IPL command; IPL "MYPROG.BA" will cause MYPROG to be automatically executed at every warm start until another IPL is issued.

Tandy (or Microsoft?) didn't miss a trick when it was specifying the application areas to build into the machine; they cover the needs of about 90 per cent of potential users at a stroke. The editor is good enough for word processing away from home, the address-book provides for most of the data management you could expect to do on a machine of this size, and the communications program caters for the rest by allowing you to download a file from a remote machine or plug into an information service. The one disappointment is the

scheduling program, of which I'll say more later.

Word processing

TEXT is a smashing little editor which can be used quite happily for basic word-processing. On selecting TEXT from the Menu it prompts for a filename, and creates one if it doesn't exist (only .DO files can be edited this way and you don't need to type the extension). The text appears on the screen with an arrow marking the end of the file. TEXT is always in insertion mode so anything you type is inserted at the cursor position; to overtype something you must delete the old and then insert. Sensibly two forms of deletion are provided; the BKSP key is a destructive backspace while DEL (SHIFT BKSP) deletes characters under the cursor, 'eating' text to the right. Automatic wordwrap operates at the end of a screen line (40 chars) though for printing or uploading a file the line width can be specified to be anything from ten to 132 columns. Carriage returns are marked in the text as little black triangles. The cursor keys work in three modes. Used alone they move by one character or line, with SHIFT they move by one word or eight lines (one screen), and with CTRL they go to either end of the current line or the beginning and end of file.

Pressing LABEL displays the following function key operations; FIND, LOAD, SAVE, COPY, CUT, SEL and MENU. FIND prompts for a string to search for though it only searches forwards from the cursor and performs a crude literal search regardless of case; the cursor is left on the first character if found, otherwise NO MATCH is printed. Pressing FIND again repeats the search unless you type a new string. LOAD and SAVE are for storing the file on cassette; merely exiting the editor with MENU saves it in RAM. SEL allows you to define a block of text; when it is pressed and the cursor moved, all the text moved over goes into reverse field. To select the whole file you'd only press CTRL SEL CTRL V. CUT deletes the marked text into the PASTE buffer while COPY copies it into the buffer. Using the PASTE key then inserts the buffer contents at the cursor position. By this means large amounts of text can be moved, copied or deleted using only three keys (plus cursor movement). All the commands are duplicated as control sequences for touch typists who don't want to leave the main keypad; the WordStar sequences being used for cursor movement. CTRL P lets the next control character be embedded in the text so that you can use bold and underlining if your printer supports them. The whole design is spare and elegant.

Address book

ADDRSS, the address organiser program works in conjunction with TEXT as an address book. A file called ADRS.DO must be created using TEXT, with all your name and address information in it. There is no compulsory format for the information except for a carriage return to separate records. Selecting ADDRSS then puts up the prompt 'adrs:'. Typing 'find John' (function key 1 types 'find' for you) will then display all the records containing John; the find function is the same used in TEXT and so it will find 'JOHN' and 'Johnson' as well as all the Johns.

Records are displayed six lines at a time; if there are too many to fit the screen then 'More' and 'Quit' are offered as options above function keys 3 and 4. Crude though this retrieval system is, it works quite effectively for a simple address book where there are unlikely to be hundreds of duplicate matches. It can be made more selective by cunning design of your database, using mnemonic codes or the many graphics symbols as search keys to label different categories, eg, the little aeroplane for airline booking offices. Like the editor it is very simple to use; a more powerful but complex database program would be counterproductive here.

Diary planning

The reason for my disappointment with the schedule organiser program is that it is exactly the same program as ADRSS! The only difference is that it requires a file called NOTE.DO instead of ADRS.DO. The idea is that you fill the file with dates and memos instead of names and addresses, and then search for the date or for some other key word. There is no real-time element in it at all, despite the fact that the Model 100 has a perfectly good clock/calendar built in. Something which reads the clock/calendar and flashes a prompt at the proper time, on the lines of Hewlett Packard's 75C, would surely not have been too difficult for the creators of MS-DOS to manage.

Communications

TELCOM, the communications program, comes up in its 'entry mode'. The key labels Stat and Term (plus Menu of course) are displayed together with a string which defines the currently set communication parameters, and the Telcom: prompt. If the parameters need to be changed then a new string is typed after the prompt; Stat merely displays the current settings again. The codes are to be found in a table in the manual. As an example 37I1E means:

Baud rate	3)00 Minimum is 75 and maximum is 19200 baud
Word Length	7) bits
Parity	I)gnore
Stop bit	1)
Line status	E)nable or XON

Terminal mode is entered by pressing Term and a new set of options appears. Files can be downloaded from a remote machine, uploaded to a remote machine in full or half duplex mode with or without echo to the printer. Only .DO (ie, ASCII) files can be transmitted. Tandy desk-top machines like the Model III or 16 already have suitable software for direct communication to the Model 100 but a 'null-modem adaptor' is needed in the line joining the serial ports. For telephone communications a post-office approved modem or an acoustic coupler will be required and for non-Tandy hosts, a suitable comms program too.

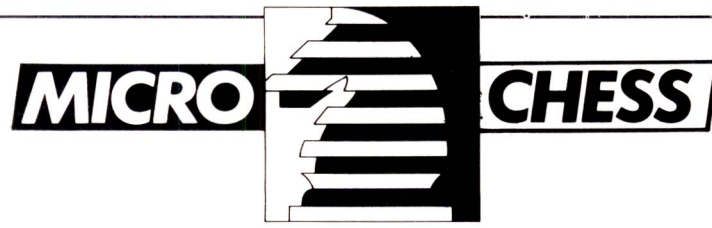
Basic

Model 100 Basic is a specially written version of Microsoft which has some interesting features, particularly in the area of interrupt handling. I won't waste space going into many details of the standard bits; let this suffice. Variable names are of any length but only two characters are significant. Integer, single and double (14 digit) precision numbers are supported and type can be declared, eg, by DEFINT X-Z, which makes all variables which begin with X,Y or Z integer only. Arrays can be of any number of dimensions. IF..THEN..ELSE is there but not WHILE..WEND. PEEK, POKE and CALL are supported and the top of Basic's memory can be set with CLEAR to make room for machine code routines. I could find no mention of a resident Monitor in the manuals, though, and none of the usual commands such as SYS did anything.

Graphics are performed by PSET and PRESET which light or extinguish a pixel on the 240 x 64 'hi-res' screen, and LINE which draws lines but has switches to draw and fill boxes too. Text and graphics are mixed on the same screen but when text scrolls, any graphics will be erased. There is a versatile PRINT USING for formatted output and in the form PRINT# USING it can be used to write formatted data to a file. A sound generator allows feeble noises of variable pitch and length to be produced.

The really interesting stuff is in the area of interrupt handling. In addition to the widely available ON ERROR..GOTO for error recovery, Model 100 Basic has interrupt handling statements called ON COM, ON TIME$ and ON KEY...GOSUB. They cause a jump to subroutine on receipt of an interrupt from the RS232 port, the clock and the function keys F1 to F8 respectively. The function keys can be programmed with strings of up to 15 characters in the orthodox way by using KEY; ON KEY...GOSUB however allows them to interrupt running program and execute one of eight subroutines. ON TIME$="12:00:00" GOSUB 1000 will cause a jump to a subroutine at line 1000 at 12 noon. This feature is rather limited in that it cannot work more than 24 hours ahead, and the use of a string to represent the time makes for extremely cumbersome programming if you want to generate a regularly repeated timer interrupt; a proper timer returning a numeric value would have been more useful. ON COM-...GOSUB allows you to write routines to allow the computer to be remotely control-

GOTO page 190



UNIVERSITY CHALLENGE

Tony Harrington hears how Martin Bryant made the transition from novice computer programmer to circumspect businessman.

There are a growing number of chess programs for home computers and the latest will shortly be released for the BBC Microcomputer. Its author, Martin Bryant, first became interested in computer chess as a computer science student at Manchester University.

Bryant took a course in Pascal programming as a standard part of his degree course in 1977. He had been school chess champion and, within a few months of beginning the degree, it struck him that writing a chess program might be more interesting than simply making a blob move about a screen.

'I wrote my first program half way through my first year,' he explained. 'It didn't work because I didn't know anything about the theory of writing chess programs. I didn't know what minimax theory was or what scoring functions or move generators were. The program that I came up with didn't even play legal chess. I lost interest for a while after that.'

What reawakened his interest was the discovery that the university mainframe, a Cyber 72, had a US chess program on it as one of its programs. This particular program was a few years old at that stage but had won the US 1971 Association for Computing Machinery computer chess tournament for mainframe programs. (Every year the ACM holds a tournament at one centre or other in the US.) 'It took me a while to stumble on the program because it was hidden away in one of the systems programmer's storage files,' he said. 'But the programmer left a listing of it lying around and I found it. I thought it looked interesting and that I could pick up some tips from it. I also bought a book by Monro Newborn called *Computer Chess*. That taught me all about minimax, scoring functions and all the other good things you need to know about to put a decent chess program together. I wrote White Knight Mk 2, my second chess program, incorporating these things. It was a better program and it played legal chess — not very well but it was at least up and running.'

That took him to the end of his first year. During the summer vacation he didn't have the use of the university machine, but he used the time to rewrite the program on paper. This time the program included all the frills expected of chess programs, such as castling and en passant pawn captures. 'The usual way to design a chess program is to worry about getting the move generators and the other essential bits and pieces working. You can always put in the extra bits later — and this was the approach I had taken with the Mk 2 version,' Bryant said.

When term started again the new, Mk 3, version was typed into the computer. This was the first program Bryant felt confident enough of to release on the University system for his fellow students to play against. Most of them did badly against the machine. This pleased him but, as he himself put it, their losses didn't exactly prove that the program was brilliant, since their chess was fairly poor.

This version lasted six months. It had a few flaws, in that it didn't understand draw by repetition. 'I also built more chess knowledge into the scoring function. For example, I told it little things that I hadn't put in before, such as that rooks on the seventh rank would be strong in most positions.'

This helped on the program a little as far as playing strength was concerned. The modified version, naturally enough, became the Mk 4. It was the first of his programs that could beat him. By the end of Bryant's second year this version, too, was ready for a rewrite. All this makes it sound as if he did nothing at university except beaver away at his chess programs, but he did manage to keep passing his exams, although he admits that it was hard going at times.

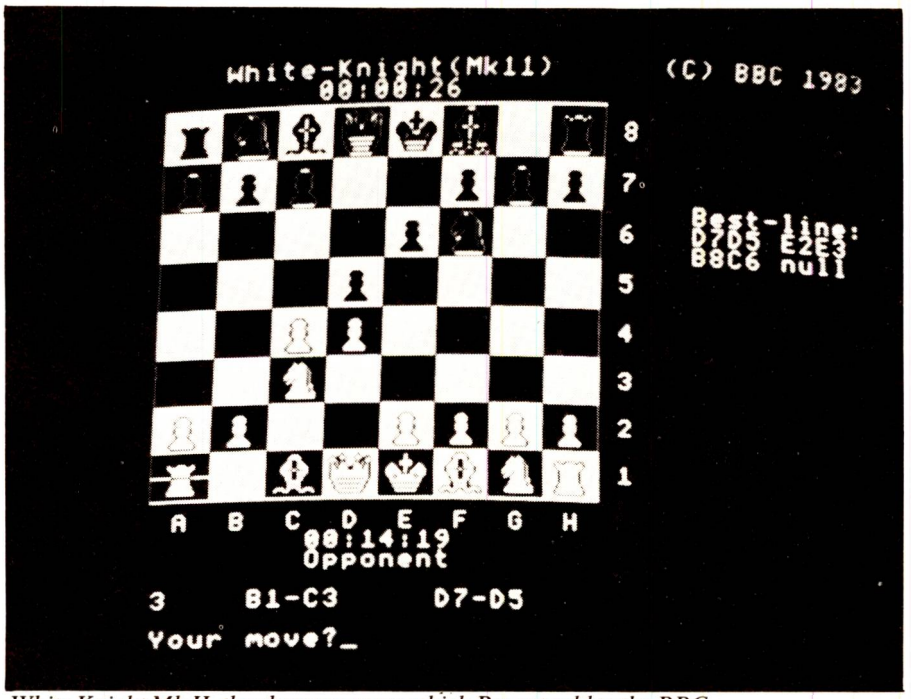
Bryant explained: 'I was totally dedicated to the chess program. I don't think that I am unique in this, because other chess programmers that I know tend to take the same attitude. Perhaps we are a weird bunch, but designing a chess program is a pretty obsessive thing. I would work at it six or seven hours a day as well as going out and also fitting in some study. It was like having a job on top of everything else. When I say that it is an obsessive business, I mean that you might find yourself leaving it alone for four months, then suddenly you start waking up in the middle of the night with new ideas and the work starts again.'

The attraction of trying to improve the Mk 4 proved just as irresistible as it had on the earlier models. But at this stage the resulting Mk 5 version meant that after two years of evolution the program was a mass of amended routines. Bryant decided that he had to throw away the program and start again from scratch, incorporating all that he had learned so far.

The summer holidays at the end of the second year were spent in the same way as the previous year — rewriting the program on paper from the bottom up. At the start of his third year, Bryant once again typed in his new version. The Mk 6 benefited from the rewrite. The program was much more efficient and ran a great deal faster. 'We had limited access to the mainframe as students. There was no time for full, tournament length games against the program. Five second chess was all we had time for and even then we ran into trouble from time to time for hogging machine time,' Bryant said.

The new Mk 6 had a deeper program search function. Computer chess programs tend to search on a brute force basis for the first few moves and then follow up high scoring lines in more depth. The Mk 6 could carry out more extensive searches than the previous model. It was released on the system and it did reasonably well against those students who felt like taking it on.

At this stage Bryant took a break from writing chess programs. He decided to try something different — like writing a chess learning program. 'I typed in 50 positions from grandmaster games and told it the moves the grandmasters had made from there, on the assumption that these would



White Knight Mk II, the chess program which Bryant sold to the BBC.

be the best moves in the circumstances. I told the scoring function to change its parameters to bring them into line with the grandmaster move (ie, if it would have previously given that move a low scoring value, it was instructed to replace that value with a higher value). The scoring function did succeed in changing its values. There is very little theory on learning programs. Most chess programmers tend to feel that chess learning programs are too slow a way of teaching chess programs the more esoteric points of chess. Certainly, trying to have a chess program learn from its own games would be a painfully slow way of doing things. But this seemed to me to be a valid short cut.'

Bryant reckons that the program took him two months to write. At the end of that time, he took the new 'educated' scoring function and used it to replace the Mk 6 scoring function. He then played a series of eight games between the old style Mk 6 and the new Mk 7, complete with its grandmaster scoring function. The results were six-and-a-half to one-and-a-half in favour of the Mk 7, which Bryant saw as reasonable proof of the new scoring function having some effect.

'The results of the learning program were rather surprising though. Some of the moves the program came up with did not seem very sensible to me, but it still beat the old style Mk 6. It might be that the moves simply looked odd to me because of my limited skills as a chess player,' he commented.

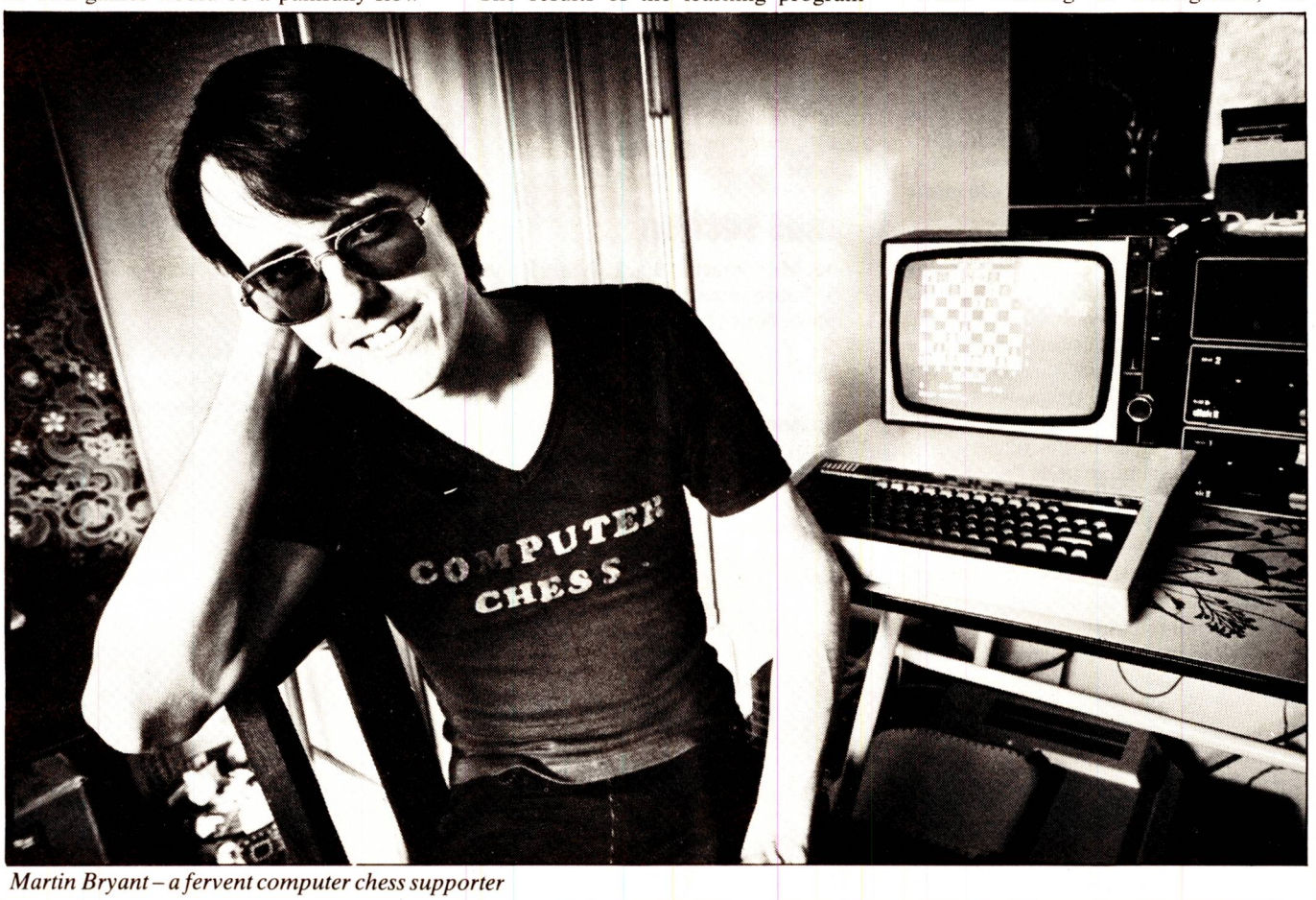
This took him to the end of his third year. That summer holiday he once more rewrote the program, improving some of the functions and changing some facets of it. In the fourth year, besides typing in the Mk 8 version of White Knight, he also joined the University chess club.

'I had spent the last three years playing nothing except computers, and the difference between their play and human chess was immediately brought home to me. Computers don't play attacking chess right from the opening. They tend to like a quiet position. The chess club reminded me how much my chess had gone off. At school I reckon that I was around 140. Now, although my chess has picked up a bit again, I reckon that it is still no better than 120.'

Despite joining the chess club, Bryant decided in his final year that finishing his degree was marginally more important than getting out yet another version of White Knight. Very little work was done on the chess computer that year. Towards the end of his time at university, though, it occurred to him that he would soon be out of reach of the Cyber 72. 'I decided to buy an Apple II. I also taught myself 6502 assembler code.'

After graduating, he went to work for a tool manufacturing company in Basingstoke as a programmer in the DP department.

While working at Basingstoke, he



Martin Bryant – a fervent computer chess supporter

UNIVERSITY CHALLENGE

started planning his first tournament entry. 'I was keen on entering a program into the 1981 *PCW* show. I translated the program from Pascal to assembler, but in the process I had to cut a great chunk out of the algorithm to squeeze it onto the micro. Other aspects of the program suffered as well.'

Bryant was so keen on getting his program into shape for the tournament that he left his job to have more time to work on it. The resulting program wasn't as good as the Mk 8, but he never had the chance to see just how it compared to it.

The Mk 9 went into the *PCW* show, but its performance was less than great. It came 10th out of 12. 'I was a bit disappointed,' he said. 'As far as a mainframe program was concerned, White Knight was rather good and I expected it to be better than most micro programs even in its cut down form. But that year Cyrus appeared, a program written by Richard Lang, and it beat everything in sight and won with a score of five out of five.'

As it turned out though, the *PCW* show gave Bryant something to replace his lost job at the machine tool factory. 'I met David and Kevin from Intelligent Software at the tournament. They were looking for chess programmers and offered me a job. I went to work for them in October 1981. Richard Lang was already working for them. Over that next year we pooled our knowledge. Our approaches to computer chess programming were very different but there were areas inside both our programs where we could draw on one another's work. Lang developed Cyrus II while I went on to produce Mk 10. This was designed specifically to fit on a micro. I rewrote the algorithms and the scoring function specifically with a microcomputer in mind. In the end it fitted inside 36k, while the Mk 9 had barely squeezed inside a 48k Apple.'

Bryant entered the Mk 10 into the 1982 *PCW* show. The machine did reasonably well and he collected the prize for the second best amateur program, with a score of three-and-a-half out of seven. The winning amateur entry ran on a much more powerful computer, so there was no real comparison between the two programs.

More important than the final placing though was the fact that at the 1982 show, Meyer Solomon, publications manager at the BBC, contacted Bryant and told him that he was interested in finding a chess program for the BBC micro. Bryant, naturally, was interested.

After further talks in October a contract was drawn up and Bryant began working on a translation (and an improvement) of White Knight Mk 10 for the BBC. The BBC micro was in many ways an ideal machine for his program. The Apple has a 1 MHz 6502 processor, while the BBC micro has a 2MHz processor. 'That was very exciting. Chess programmers slave away to try and get a ten per cent increase in speed in their programs, and to get a 100 per cent increase just by translating the program was incredible,' he commented.

The new version, called Mk 11, had a better scoring function and some minor changes were made to the algorithm. It also had a range of functions added to it. 'The final version which I sold to the BBC can forward step or backward step through the whole game to a maximum of 120 moves. Any legal chess position can be set up and the program will run an automatic check on the legality of the position — it won't let you play on without kings on the board, for example. It is also about five times faster, in problem solving mode, than any of the commercial programs I have seen.'

The screen display is light blue on black. One nice feature is that there are clocks for both sides incorporated in the program. There are no levels to be set up, since the program can be handicapped by giving it less time to complete the game.

One thing the program does not have is an openings book. 'This is a long standing argument in computer chess programming. An openings book tends to be of value in actual play only if it is very well set up. The BBC micro simply did not have enough space in its 32k for me to incorporate an openings book. 10k of the BBC's 32k goes to handle the screen while other functions also take a bite out of the available memory. I wrote the program to run inside 20k,' Bryant said.

Since selling his White Knight program, Bryant has been hard at work writing another program to compete in this year's *PCW* show. He intends running a program called Collosus on an Apple with a 3,85 MHz accelerator board.

'I have to design the whole thing from scratch, since I obviously can't just translate the old White Knight algorithms. I have to find a new approach and new algorithms. Whether the program will be ready or not in time for the show I don't know — but I am working on it!'

I hope he succeeds in his aim.

Games section

White: Micromurks; Black: White Knight; *PCW* Tournament, London 1982; French Defence; Notes by David Levy.

1	e2-e4	e7-e6
2	d2-d4	Ng8-f6

(Unusual, but in a computer v computer game it is not easy to refute irregular openings variations.)

3	e4-e5	Nf6-e4

(The knight cannot be trapped, for example, 4 f2-f3?? Qd8-h4+ 5 g2-g3 Ne4xg3.)

4	Nb1-d2	Bf8-b4?

(4 . . .Ne4xd2 5 Bc1xd2 c7-c5, would give Black an easy game.)

5	Qd1-g4?	

(This allows black to strand the enemy king in the centre.)

5	. . .	Ne4xd2
6	Bc1xd2	Bb 4xd2+
7	Ke1xd2	0-0
8	Ng1-f3	d7-d5
9	Bf1-d3	Nb 8-c6?

(White could now win with 10 Bd3xh7+ Kg8xh7 11 Qg4-h5+ Kh7-g8 12 Nf3-g5 Rf8-e8 13 Qh5xf7+ Kg8-h8 14 Qf7-g6, and Black can resign because of the simultaneous threats of mate on h7 and winning the queen by Ng5-f7+.)

10	c2-c3	f7-f5
11	e5xf6 e.p.	Rf8xf6
12	Ra1-e1?	

(Overlooking the full force of Black's reply.)

12	. . .	e6-e5!

(Winning material, because of the threat to White's queen and the threat of e5-e4, forking two pieces.)

13	Bd3xh7+	

(The best chance, but not good enough.)

13	. . .	Kg8xh7
14	Qg4-h4+	Kh7-g8
15	d4xe5	Rf6-f5
16	Qh4xd8+	

(White would do better to try to keep queens on the board with 16 Qh4-g3. Now Black's material advantage will be decisive.)

16	. . .	Nc6xd8
17	Rh1-f1	Nd8-e6
18	Kd2-c2	Bc8-d7
19	Rf1-g1	Ra8-f8
20	Kc2-b1	Bd7-a4
21	h2-h4	Ne6-c5
22	e5-e6	Kg8-h8
23	b2-b3	Ba4-b5
24	e6-e7	Bb5-d3+
25	Kb1-a1	Rf8-e8
26	Re1-e5	

Again allowing Black to trade pieces. It is surprising how many programs do not know that when you are behind in material you should try to avoid exchanging pieces!)

26	. . .	Rf5xe5
27	Nf3xe5	Bd3-e4
28	f2-f3	Re8xe7
29	f3xe4	Re7xe5
30	e4xd5	Re5xd5
31	Ka1-b2	Rd5-d2+!

(Black starts to mop up in the most efficient manner.)

32	Kb2-a3	Nc5-e4!
33	c3-c4	Ne4-c3
34	Rg1-c1	

(White cannot save both the a-pawn and the g-pawn.)

34	. . .	Nc3xa2
35	Rc1-a1	Na2-c3
36	Ka3-b4	Rd2-a2
37	Ra1-f1	Nc3-e4
38	Rf1-f8+	Kh8-h7
39	g2-g4	c7-c6
40	c4-c5?	Ra2-c2
41	Rf8-a8	a7-a6
42	Ra8-b8	Ne4xc5
43	h4-h5	a6-a5+
44	Kb4xa5	b7-b5!
45	Rb8-e8	Nc5xb3+
46	Ka5-b6	Nb3-d4
47	Re8-e4	Rc2-c4
48	Kb6-c7	b5-b4!
49	Kc7-d6	b4-b3
50	Re4-e1	Nd4-b5+
51	Kd6-d7	b3-b2
52	Re1-b1	Rc4-c2
53	Rb1xb2	

(White realised that other moves allow . . . Nb5-c3, etc)

53	. . .	Rc2xb2
54	Resigns	

END



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PROGRESS REPORT



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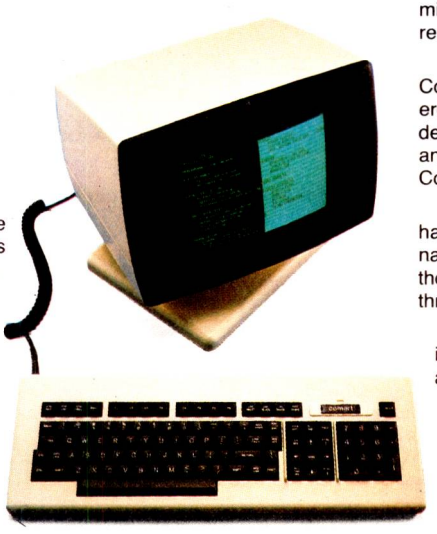

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SOFTWARE
WHICH SPREADSHEET?

MATHEMATICAL TANGENT

Mike Liardet looks at Mathemagic — a 'super-calculator' alternative to the spreadsheet — and also verifies how well its sister Graphmagic can plot VisiCalc files.

This month I am setting two exciting precedents in the 'Which Spreadsheet' series: Firstly, I am going to look at twice as many products as usual, and secondly, neither of them are, strictly-speaking, spreadsheet systems. The products, Mathemagic and Graphmagic, are produced by a US company called International Software Marketing ('ISM'). Just to disprove my theory that use of 'International' in the name of a small company means that it is probably run from a bed-sit, ISM does have some legitimate claim to the title, since it has set up a UK company, ISM Ltd, to market its products over here.

Mathemagic is a fairly unique piece of software, providing mathematical modelling facilities, but differing radically from spreadsheet systems. Basically it transforms the computer into a flexible and super-powerful programmable calculator. It would not be feasible to use it for, say, generating a large, financial, 13-column report. On the other hand, it is more likely to appeal to the technical user, since it provides good facilities for working with complex mathematical expressions.

Graphmagic is easier to place in the 'general scheme of things'. It simply transforms numeric data into bar graphs, pie diagrams or line graphs. In particular, it can plot results from Mathemagic (of course) and any spreadsheet system that can generate DIF ('data interchange format') files, eg, VisiCalc. Interfaces to the Multiplan and SuperCalc spreadsheet systems are also in the pipeline, and DBase II as well.

My review copies of the packages were for the Apple II, but both are available for CP/M machines and the IBM PC. Each package comes as a single disk with a slim A4 size manual. Underneath the elegant front covers, the manuals have a 'home-produced' look about them, presumably run-off on the office daisy-wheel printer, but nonetheless the typeface is clear and easy to read. It is theoretically possible to use either package independently, but it is more logical to consider Mathemagic first:

PART 1 ~ MATHEMAGIC

Getting Mathemagic started on the Apple is quite straightforward. Simply insert the disk, switch on, and the system 'boots' automatically. No need to pause to copy the disk, because ISM has copy-protected it! If and when the disk wears out, you have the inconvenience of ordering a replacement from ISM.

Although not needed immediately, it is a good idea to have a data disk initialised and ready for storing any formulae and results. There is no facility within Mathemagic for doing this, so I had to switch off and wrestle with the intricacies of Apple DOS. Not such an easy start after all! The Mathemagic manual has no information whatsoever on this; indeed a newcomer faithfully following the manual would probably assume that a blank disk fresh out of the packet would be sufficient.

Once over this hurdle, and having rebooted, the Mathemagic 'master menu' is displayed. Any lingering doubts that it might actually be a spreadsheet system marketed as something else are quickly dispelled. The display is filled by three clearly marked boxes, one above the other. As always with the 40 x 24 character Apple, the prompts are fairly terse and cramped, but presumably this would not be a problem with the IBM and CP/M incarnations. The top rectangle is used for menu displays, giving all options currently available. The middle area is a 'scratch-display', showing the progress of calculations, etc, and the bottom is used for input of formulae. This arrangement is used at all stages in the program, even when some of the areas are not needed — a waste of precious screen space. And there is certainly no sign of a spreadsheet lurking anywhere!

Anyway, having reached the master menu, I was keen to set up a formula quickly and to see how the calculation facility works. After all, this is Mathemagic's major claim to fame, and all its other facilities exist simply to support or complement this. Regrettably the manual does not anticipate a new user's impatience in this direction, and buries the vital information in a morass of detail about formula syntax, numerical precision, exponential format and other nit-picking detail totally irrelevant when you are still at the '2+2' stage.

Throwing the manual into a far corner, I decided to proceed by instinct, and enjoyed fairly instant success. The program prompts and menus are fairly well thought out, and it is reasonably obvious what to do at each stage. A few tentative keystrokes and I was typing in a simple formula. Actually, I did have to sheepishly scurry over to the battered manual to ascertain the syntax of variable names, but apart from that things went quite smoothly.

Calculations

Just to give the reader a feel for Mathemagic's calculation facilities, we will take a look at a few simple examples:

* 2+7*9. Mathemagic uses a fairly standard syntax for its expressions; for example, multiply always explicitly entered as '*', etc. Having entered this fairly trivial formula, Mathemagic does not respond with the answer immediately. First it performs a syntax check, which can take

several seconds if the formula is complex, then if everything is OK, it quietly returns control to the formula menu. Simply hit '/' to calculate, and 'hey presto' the answer appears! If that was *all* it could do we would have the world's first £3000 pocket calculator, so on to more tricky calculations.

* VOL = (3.14156 * RADIUS^2) * ALTITUDE. This expression calculates the volume of a circular cylinder (eg, a pot of paint). Press the calculate key and Mathemagic requests you supply a value for RADIUS. Enter a value, and then there is the same procedure for ALTITUDE. Finally, the answer is displayed. Try calculating again, and no values are requested, so the answer is the same this time. Values are requested only when a variable (such as RADIUS, ALTITUDE or whatever names we choose) is encountered for the first time. Unless . . .

* VOL! = (3.14156 * RADIUS^2) * ALTITUDE? Note the '!' and '?' characters. The first time this formula is calculated it works the same as above, but on subsequent calculations it will ask for ALTITUDE only. Appending the '?' to a variable means a new value will be requested every time a calculation is performed. Having calculated the volume for several different altitudes, it is time to examine the variables. A few keystrokes reveals a list of all variables, with their current values. The use of a '!' after VOL makes a new variable: VOL1, VOL2 . . ., etc, every time a calculation is made, thus all the results from the previous calculations are preserved. Without the '!', there would be only the one variable 'VOL' giving only the most recent result.

* Y! = X^3−10*X^2 + 4*X + 120;X= X+ 1. This formula is intended for use with the 'repeated calculation' facility. Requesting, say, ten repetitions and setting an initial value of 0 for X will result in variables Y0 . . . Y9 tabulating the values of the function 'y = x^3 −10x^2 + 4x +120' for x = 0..9. Notice that there are actually two expressions, separated by a ';'. The first does the calculation and the second 'increments' X so it has a different value 'next time round'. The different values of Y can be saved in a disk-file, which can be read by Graphmagic, and subsequently plotted (see Fig 1).

* FY1=@FUNCY; X = X + 1; FY2 = @FUNCY;AREA = AREA + (FY1 + FY2)/2. The formula above shows the kind of area where Mathemagic scores over spreadsheet systems, namely in iterative problem-solving and formula manipulation. It actually calculates the area under a curve (eg, the shaded portion of Fig 1), using the 'trapezium rule' (back to your O level maths books for this, I am not explaining it here). Firstly, '@ FUNCY' must previously have been set up with the expression for the graph we are interested in (eg, @FUNCY = X^3..+120). Thereafter we can use '@FUNCY' instead of retyping the whole expression every time we need it. Once set calculating, Mathemagic runs through the four expressions from left to right. After getting an initial value for X it can calculate FY1, increment X, then FY2. Not having seen AREA before, it needs an initial value for it, (which must be 0 for the formula to work). If set to do ten repetitions with @FUNCY set to the expression above, then it will calculate the shaded area of Fig 1 (with an answer of 575).

Other features

As I have already pointed out, the *raison-d'être* of Mathemagic is its calculating abilities, but just for the record, and briefly, it does have other features:

* Link to Graphmagic. Results from Mathemagic can be transferred via a disk-file to Graphmagic for subsequent plotting.

* Logs and Trig. Mathemagic has a fairly comprehensive maths library. (Fig 2 is a plot of y=cos(sin(x)) from data generated by Mathemagic).

* Error handling. Mathemagic is fairly robust, and handles errors quite well: both operator errors with disks and calculation errors, such as division by zero.

* Printouts. It is possible to print both results and formulae. There is also a trace facility, giving a blow-by-blow account as it performs a calculation. Like most trace facilities this can easily use up huge quantities of printer paper, but can be useful for 'debugging' a problem formula.

Limitations

The worst aspect of Mathemagic is the manual. Quite simply it has been very badly put together, assuming far too much prior knowledge on the part of the user. There is no key-by-key tutorial, and the information is badly ordered. For example, fairly early in the manual we are treated to two whole pages (and there are only 48 in total) on the precision and syntax of numbers. This information would be useful occasionally, eg, when problem solving with very large magnitudes, but just causes confusion and irritation when placed with such prominence.

Mathemagic has a laughable 'help' facility. Hit 'H' in the master menu and you are treated to precisely 58 words telling you what each area of the screen is for. (Anyone know of a shorter help-facility? Yes me! Just 47 words in, wait for it, Graphmagic!)

Other limitations are more technical. A primary one is that only 40 variables can be accommodated. Every repetition of a variable using '!' (see above) consumes one of those 40, so it is fairly easy to run out of space, although unwanted variables can be deleted to make room. Another problem lies with the @ facility. Suppose you set up a formula to calculate compound interest, and want to use it simultaneously for calculations of savings and borrowings. This involves a lot of switching around with variables (for the different interest rates, etc) since Mathemagic does not perform this automatically (unlike most programming languages, eg, Basic and DEFFN). An unfortunate omission is that of conditional and logic functions, like those provided by many spreadsheet systems. If these were present, many more iterative

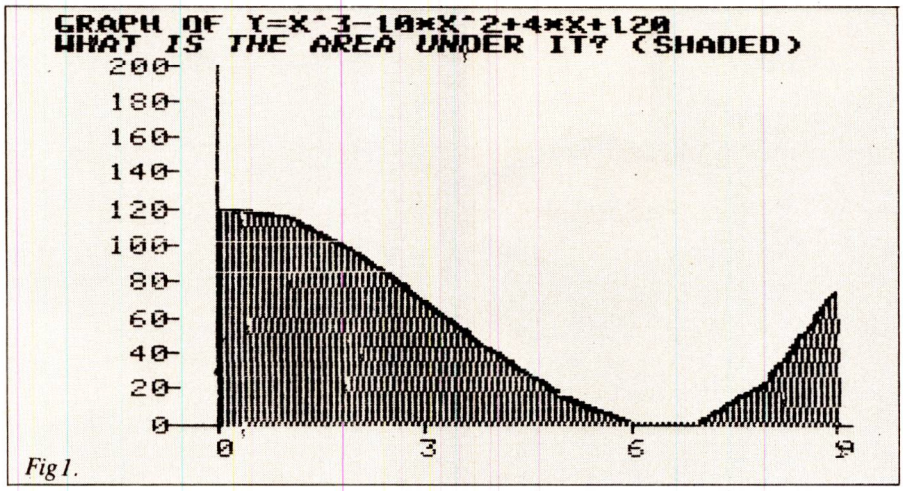

Fig 1.

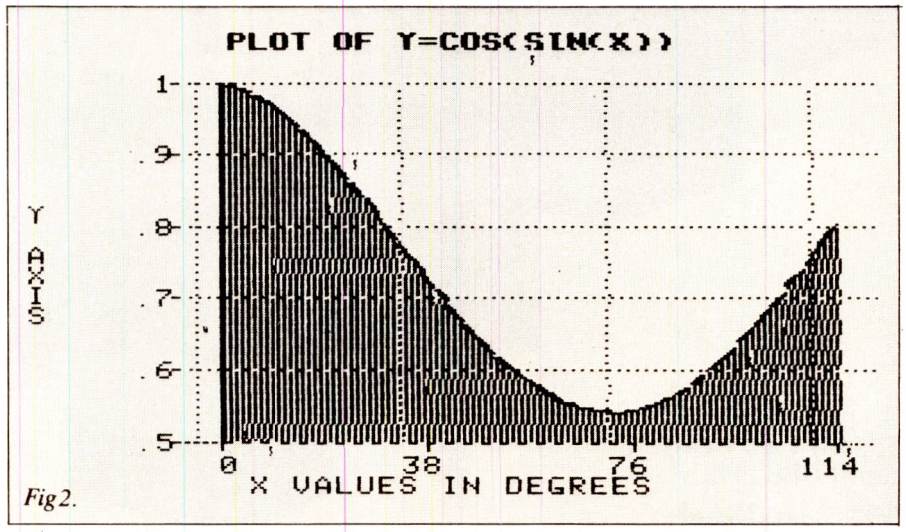

Fig 2.

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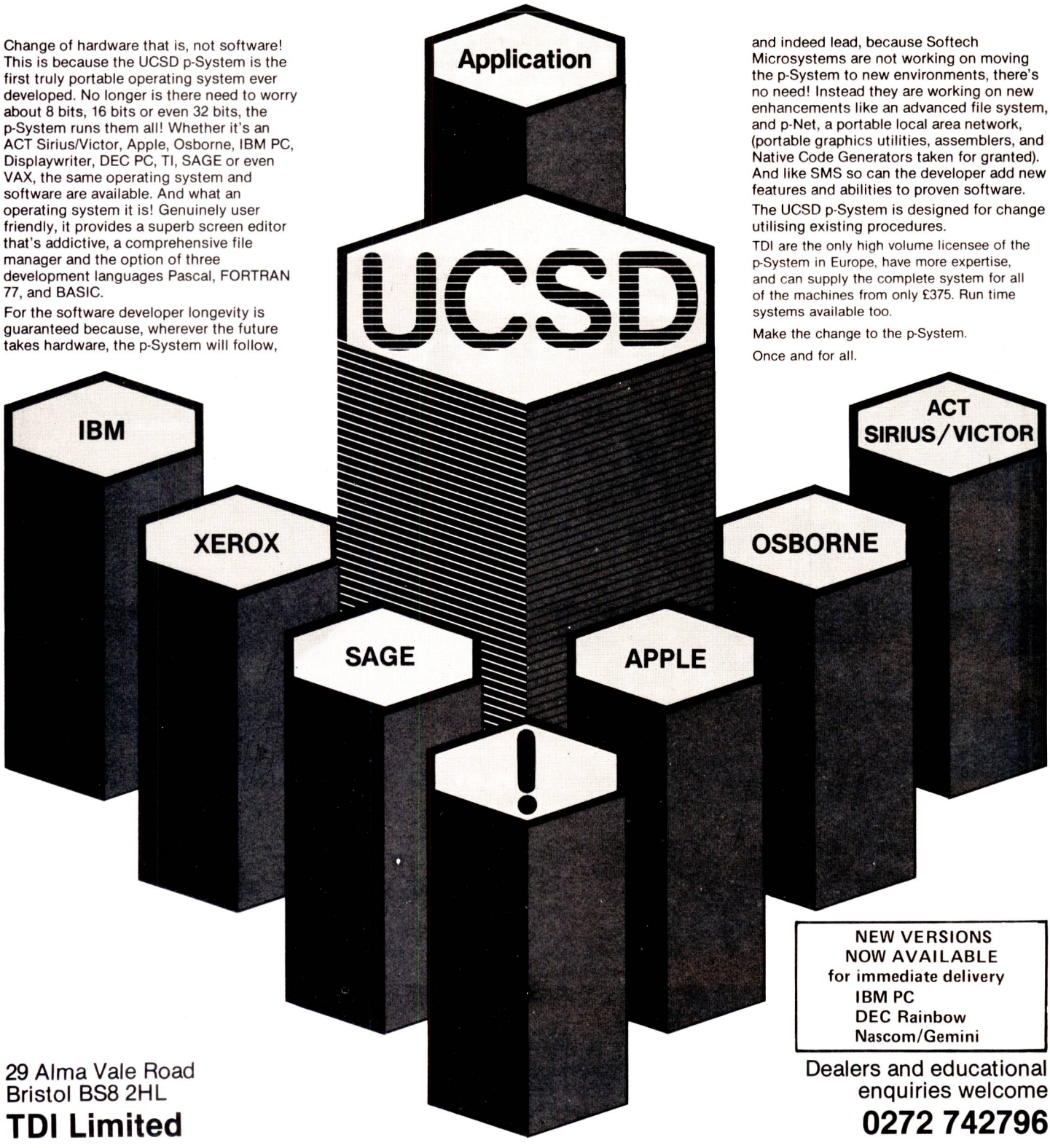

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MATHEMATICAL TANGENT

numerical problems could be attempted.

Finally, the system, written in Basic, is a little slow, although it keeps the user well informed while it's working — for example, it displays what is happening to a formula as it is being calculated. This keeps you amused while you wait, and also lets you know if the calculation is not working out as you intended, and you can quickly abandon it, a nice point.

Summing up

In conclusion, Mathemagic provides a very interesting alternative type of system to the spreadsheet. Just like the spreadsheet, it is an attractive proposition to anyone currently spending an excessive amount of time with calculator, pencil and paper. However, at £70-£130 (depending on version), it is only marginly cheaper than an average spreadsheet system, and moreover it cannot handle the large worksheet type of application that can be handled so well by VisiCalc and its ilk. So, is it going to be of any interest to anyone? Well, I would say, yes. Firstly, it has a sort of cosy calculator feel about it, which may be of comfort to the agoraphobics who get lost in the wide open spaces of a spreadsheet. And secondly, it does have some very powerful facilities for dealing with complex mathematical formulae. Coupled with its abilities to do repeated recalculations, this will appeal to the more technically minded.

Mathemagic checklist

Documentation:	48 A4 pages plus reference card. Content poor.
User-friendliness:	Good. Consistent to use and error-handling worked well.
Facilities:	Good alternative to spreadsheets as a modelling system. Much smaller capacity and more calculator-like, but useful facilities for the technician.
Available on:	Apple II, CP/M and IBM PC.
Price:	£79-£130 + VAT, depending on version.
More information:	ISM Ltd, Unit 683, Armadale Road, Feltham, Middlesex, TW14 0LW, tel 01-751 5791.

PART 2~GRAPHMAGIC

Apart from similar names, it is very obvious that these two packages are from the same stable. For better or worse, software, documentation, presentation, interactive techniques and so on are all very much the same. Of course it is a big advantage that there is no need to learn new interactive techniques for running Graphmagic, and a massive disadvantage that the manual is no better.

Printer problems

Everyone knows that it is relatively easy to plot graphs on many micros, but it is another matter to get them printed out on paper. Quite simply it is a package-developer's nightmare to cater for all combinations of printer, interface, computer, etc. All I can say about the Graphmagic documentor and implementor is that he must be a very sound sleeper as there is no evidence that he has made a serious attempt at providing much help for the user in this respect.

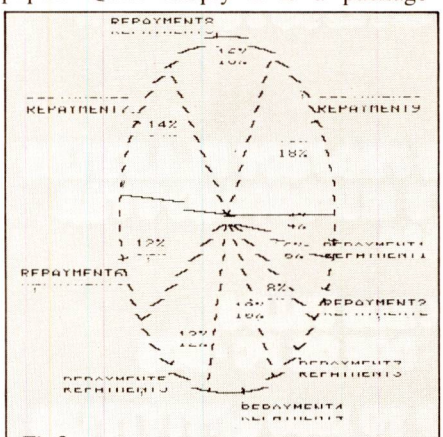

Fig 3

Firstly, Graphmagic will — in theory at any rate — print its plots on an Epson MX-80, Silentype and IDS printers. Actually, the documentation does not mention this at all, but the facilities can be found by trial-and-error when running the program.

Having an MX-80 to hand I selected this option and attempted to print a pie diagram (see Fig 3). Now the fact is that there are several versions of the MX-80, at least three different interfaces available for it, around 20 internal switches, and a choice of several interface cards usable at the micro end. Therefore, it would not be unreasonable to expect some basic advice as to what particular configuration gets the results, but ISM has abdicated all responsibility in this respect.

Anyway, after an ineffective phone-call to ISM, a great deal of head-scratching and trial and error, I eventually hit upon a short-term fix using a Basic program to preset the MX-80 in the right mode, and then immediately running the Graphmagic system without switching the printer off. In the long run this would not be satisfactory, but at least it enabled me to get enough plots done to accompany this review. Even so, they are not of the highest quality, whereas the same MX-80 worked quite well in non-graphics mode (see Fig 4).

My advice to anyone considering the purchase of Graphmagic is first to see it working on a hardware set-up identical to your own, and then make careful note of all switch settings, cables, etc for when you try and use it yourself.

And finally, my advice to ISM is to take a leaf out of MicroPro's book. For all its faults, WordStar is excellent in its user-facilities for interfacing to a vast range of different printers.

Spreadsheet links

A major reason for including Graphmagic in this review is its ability to link to other spreadsheet systems. Currently it can read files in the 'data interchange format' (DIF) introduced by Software Arts as a proposed standard file format for spreadsheet applications. This means that Graphmagic can work with data generated by VisiCalc in particular, but currently with little else, since DIF has not caught on much elsewhere (eg, Microsoft's Multiplan avoids DIF, but introduces a rival SYLK — symbolic link format). However, Graphmagic links to SuperCalc and Multiplan are in the pipeline, and may even be available by the time this is printed.

In order to test the VisiCalc link, I set up a small spreadsheet model under VisiCalc

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SALES REV	7562.00	4378.00	9154.00	5174.00	11940.00	4378.00	9154.00	6766.00	9154.00	5572.00	6766.00	6368.00	86366.00
75%COSTS	5671.50	3283.50	6865.50	3880.50	8955.00	3283.50	6865.50	5074.50	6865.50	4179.00	5074.50	4776.00	64774.50
OVERHEADS	1000.00	1000.00	1000.00	1000.00	1000.00	1000.00	1300.00	1300.00	1300.00	1300.00	1300.00	1300.00	13800.00
PROFIT	890.50	94.50	1288.50	293.50	1985.00	94.50	988.50	391.50	988.50	93.00	391.50	292.00	7791.50

Fig 4 Printout from VisiCalc

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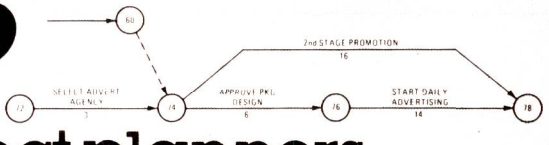

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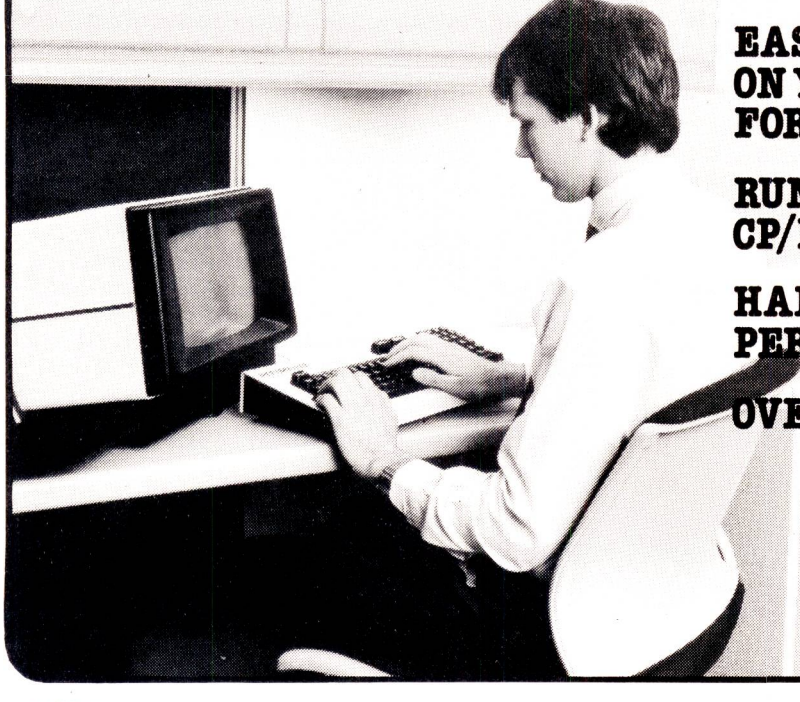

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(see Fig 4); the idea being to use the bottom line profit figures to generate a pie diagram. VisiCalc makes it very straightforward to save selectively just the 12 months profit figures in a DIF file.

Immediately the file was saved, I switched off and rebooted with Graphmagic, typed in the command to load, and sure enough, the data recently on view with VisiCalc was suddenly there in Graphmagic. Unfortunately Graphmagic assigns its own variable names to incoming DIF data, so instead of the variables being called Jan, Feb, etc, they get called DIF9, etc. It is easy to save both text and numbers in VisiCalc's DIF, but Graphmagic totally ignores any text so there would be no point in saving the column headings or whatever. Graphmagic does provide a facility to rename variables, but I opted not to do this since it is fairly laborious and almost eliminates the point in using the link anyway. After all we could just print out the results in VisiCalc and then retype the whole lot again, ignoring DIF altogether.

Once the DIF file was loaded, I selected the pie diagram option, and was immediately viewing the egg diagram in Fig 5.

Bar and line graphs

Graphmagic also provides facilities for bar and line graphs, which are fairly quick and easy to use. Once the data has been loaded a single key-stroke will quickly draw the graph. This is a particularly nice aspect of the program. Basically it uses 'defaults' for drawing the graphs, thus there is no need to go through a lengthy setting-up procedure before you can see anything happen. However it is possible to override these defaults to achieve special effects, and modify the graphs in various ways:

* Titling. Both the axes and space at the top of the graph can be given text descriptions, which get displayed with the graph. This aspect of the program provided me with an opportunity to add to my 'widget-collection' (a growing list of US programs using the word 'widget' for illustrative examples).
* Axes range. These can be freely modified to stretch the graph horizontally or vertically, if the default scales are incorrect.
* Statistics. If you opt for statistics, then mean, median and mode lines are drawn horizontally across the graph.
* Grid. The graph can be overlaid by a grid.
* Graph Overlays. With both bar and line graphs, several graphs can be overlaid, in different colours, to facilitate comparisons, etc. It is also possible to arrange bar graph plots to be left, right or centre justified, so that when one plot is superimposed on another, the bars don't actually land on top of one another, but shift slightly to the side.

Just as an illustration of some of these features, see Fig 6.

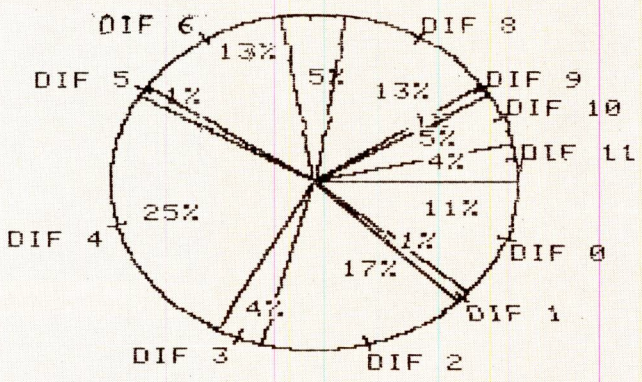


Fig 5 An egg diagram—data from VisiCalc

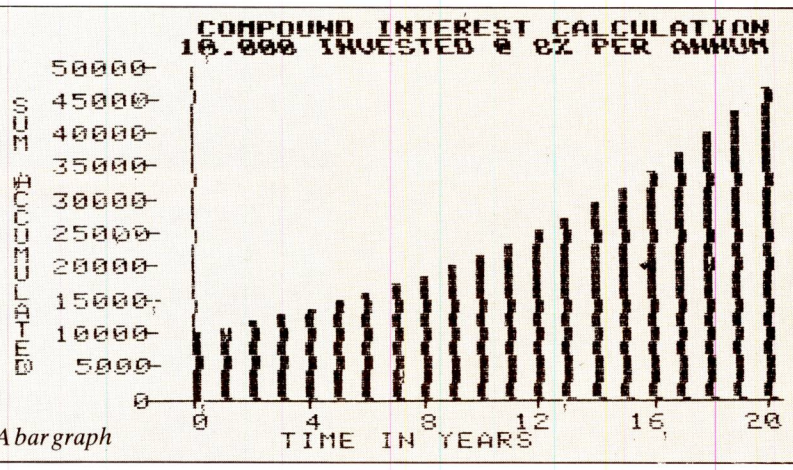


Fig 6 A bar graph

Two dimensional graphs

Graphs, like those plotted by Graphmagic are two-dimensional. This means that to correctly calculate the position of a point in a graph, two numbers are needed, called the X-coordinate and Y-coordinate. Graphmagic plots two-dimensional graphs using just the Y-coordinates (that is, the single values for each of the variables). In the absence of any other information it is forced to make gross assumptions about the X coordinates. Namely that the X-coordinate going with the first variable must be 0, the next must be 1 and so on.

This turns out not to be a terrible handicap for dealing with, say, monthly financial figures, since we can easily cope with Month-0 instead of January, and so on, and of course the interval between each month is the same (as far as accounting is concerned). Dealing with more mathematical problems, things do get a lot more tricky. For instance, when using Mathemagic, it is necessary to make a note (on paper) of the X-coordinates corresponding to the Y-coordinates, and then get involved with rescaling the X-axis, before the graph is plotted. As far as I can ascertain, it is impossible to plot a graph correctly if the Y-coordinates are not defined for some regular interval of X, (eg, (0,7) (1,10) (3,12) have an X-interval of 1−0=1 for the first pair of coordinates, but 3−1=2 for the second).

Summing up

There is clearly a lot of room for improvement in Graphmagic's dealings with printers. It does, however, provide quite flexible plotting facilities, managing bar graphs, pie diagrams and line graphs with all sorts of other bells and whistles as well. Its link to VisiCalc files is a little disappointing, since it can only read the numeric data, in a fairly unstructured way as well. It would not take much longer to retype the information by hand, so the link should not be taken as a major reason for buying the system. END

Graphmagic checklist

Documentation:	55 A4 pages, no reference card. Content poor. No information on interfacing to graphics printers.
User-friendliness:	Badly let down by the printer problems; otherwise quite good. Consistent to use, but a bit tricky to deal with scaling of graph axes.
Facilities:	Pie diagrams, bar and line graphs, with data link to VisiCalc and Mathemagic. Links to Multiplan, SuperCalc and DBase II forthcoming.
Other details:	Identical to Mathemagic.

A MAGICAL QUEST

Maggie Burton gives full vent to a wild imagination in this review of Sir-Tech's Wizardry.

It was a dark and gloomy day when our six adventurers set forth upon their quest. All of them had just come from the training grounds, where the rudiments of their skills are taught, and they were eager to gain prestige and experience in battle.

After taking food and ale in Gilgamesh's tavern they assembled and went to Boltac's trading post, where the friendly old dwarf sold them all the weapons and armour they could afford — which did not amount to very much. Each member, however, felt he was adequately equipped.

After the trading post it was camp at the entrance to the maze — the proving grounds of the mad overlord — and a little time to organise themselves, read spell books and get into a marching order. This done, the little party went on into the depths of the maze, to fight whatever crossed their paths and to bring back rich treasure.

They had not got very far when they were set upon by a group of five creeping cruds and two kobolds. Brian the priest and Icabod the dwarf fighter both received terrible wounds from the encounter. Feckless Eddie, a powerful mage, was slain by a creeping crud who was able to resist Eddie's spell. The party of five remaining members took a small amount of gold back to the castle, where Feckless Eddie was removed and taken to the Temple of Cant.

The party returned to the tavern and met a new member, Loboc, who was an elfin mage of similar powers to the demised Feckless Eddie. After completing the requisite weapon buying, camping and spell book reading again, the party ventured once more into the oppressive gloom of the maze.

They travelled for a long time through the tunnels, occasionally coming across the corpses of earlier, unfortunate, explorers until they suddenly blundered through a secret door into a dark area where they could not see to escape.

I know not if they still survive in the maze but I left them there and started again. That was one of my first rather ignominious games of Wizardry. The same fate befell me several times more before I managed to get much further, but each time was different and fun.

Wizardry was written by Sir-Tech Software in Ogdensburg, New York State and has been on sale in this country for about a year through a sole importer. Written in Pascal for the Apple II with DOS 3.3, it is claimed that Wizardry is probably the biggest microcomputer game ever written. Its size is far bigger than that of the Apple's memory and much of the code is in overlays.

Tolkein and Dungeons and Dragons are the inspiration of the game. Much of what befalls the player is totally random, as it is in most adventures. While some adventures have a specific quest in mind Wizardry has none except the killing of monsters and the gathering of loot, magical objects and power. There is a quest there somewhere but somehow it pales into insignificance before the battery of other things to do. The object is simply to dash into the maze, kill monsters, nick their swag and dash out again while you're still capable of escape. As you make more and more trips your experience rises, you can buy more powerful weapons and a character might even rise to the next level of power.

Booting Wizardry

Wizardry comes on a double-sided disk. One side is the game and utilities master, the other the adventure scenario (that is, the maze, castle and your characters). The game master is the boot side and this is marked 'boot this side'. The other side will not load alone.

Once you have loaded the program and pressed return (actually, any key seems to work) to get rid of the title page, you may either replot the title (perhaps a little unnecessary), start a game or use the utilities. Generally the program is controlled using one-letter commands or returns, and is menu-driven throughout.

Starting a game, as with most good Apple software, involves swapping disks about a lot. Once you have chosen to start a game, you will have to flip the master disk over, load the other side and, if you are sensible, change it for a backup scenario disk. You can create as many of these as you want from the utilities and play with 20 characters on each. It is sensible not to use the scenario master to play games as this cuts down on disk wear.

Creating characters

Wizardry follows the style of dice throwing, role-playing games in that you create your own characters, control them and build them up. You are not so much a member of the party yourself, as one who plays God in creating, equipping and maintaining your characters.

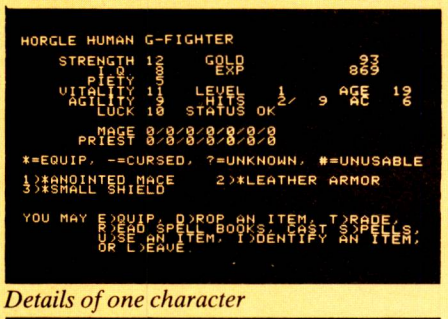
From the start of the game in the Castle you have to go to the edge of town and from there to the training grounds where you can make up your characters, rename them, change their classes and so on.

This has to be done before any of the meaty bits can be bitten into. To make a character, you choose a name, race and alignment — good, neutral or bad. You can also include a password but this is inadvisable because unless you can remember the password you cannot do anything with that character — not even delete it — so it just sits there and hogs space on the disk.

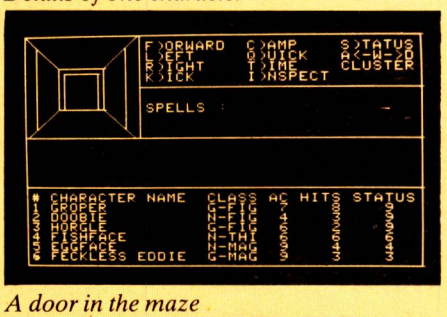
If you are creating a whole lot of characters at once, it is as well to remember that good and bad characters cannot adventure together. Also some classes of character (class denotes what skills a character may have and what weapons he may carry) must be of a particular alignment.

Class is all-important for your characters. At the first level of play you have four possibilities: fighter, priest, mage and thief. Your character is given points indicating ability in such areas as strength, piety, IQ, vitality (denotes how long a player can fight without sustaining damage), luck and agility. On top of the points awarded by the computer you are given a number of points to distribute yourself. This is how you make your character fit into the class you want. Each class requires a character to have a certain number of points in one area of ability.

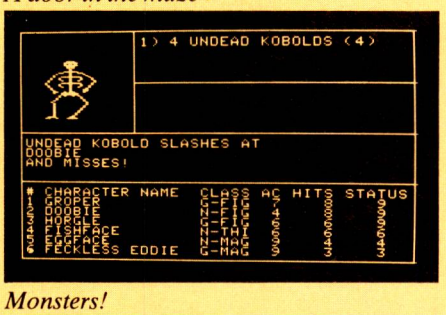
Six is the maximum number of members



Details of one character



A door in the maze



Monsters!



Rest at the Adventurers' Inn

System utilities

Wizardry includes a selection of utilities which have varied purposes. These are obtained from the main master disk as an option instead of starting a game.

The first of these enables the user to perform that most despicable activity — cheating. It is the Recover option, and it allows you to bring lost characters from the maze — minus all experience points and gold found on that trip, but otherwise unscathed. If you get too far into the maze and can't get out, you can avoid having to find your way back by using Recover. In honest terms, though, this option is provided to guard against genuine power failure and the like. No mention of nefarious purpose is ever given in the manual (it leaves it up to you to deduce this simple point).

Other utilities allow you to move characters from one scenario to another. This is useful as Wizardry actually consists of three scenarios (how I hate that word). The one reviewed here, the Proving Grounds of the Mad Overlord, is but the first.

You can also change character names and back them up. Backing up characters is extremely useful but you can only move backed up characters onto the disk from which they came.

to one adventuring party — you can, of course, only have one party in use at a time. It is best to use the maximum number and to use the combination which is recommended by the manual — two fighters and mages, one priest and one thief. Both mages and priests can cast spells to heal the injured and to slaughter monsters. At the beginning very few spells are 'known' by a character but these build up as experience points grow.

The dreaded maze

Once you have created all the characters you need (and a few in reserve to replace those who get killed) you may then go to Gilgamesh's Tavern where you assemble a party. This done you move on and buy weapons at Boltac's trading post.

Characters do not start out with very much money. They can only afford to buy very basic weapons and defences at first, and there are weapons some classes may not use — these are outlined quite clearly by the program. Most of the benefits given to characters in Wizardry are a bit pricey if not downright expensive, though if you play your cards right you can end up with a lot of treasure and items found in the maze which Boltac will buy from you — for the lowest price possible, of course.

After you have bought your weapons you go to the maze — where the action really gets hot.

All this hanging about selecting characters and buying weapons takes some time, but the program is well put together and easy to follow once you have read some of the manual and understood any conditions which might apply to what you want to do.

The maze is the best bit, but it is unwise to hang around there. The best way to build up a few rich and successful characters is to rush in, do the dirty work and rush out again with loot and extra experience points for battle victories. The most pointless thing that can possibly happen to a party is for them to get lost, which is very easy if you are not careful to map every turn you take.

It's also a good idea to strip the dead of their possessions before leaving the maze altogether, otherwise the Temple benefits from your magnanimous sacrifice. Should you come across other dead characters from previous parties in the maze you can rescue them, loot them and have them kept in the Temple. This is a good way of saving any good characters you might have lost in combat because, for a large fee, the Temple will try to resurrect them. You may not rescue a dead character if you have six in your party. Furthermore, if one of your number is killed in battle the rest of your party will have to drag him along until it leaves the maze. As if you didn't have enough to contend with already . . .

Resurrection does not always work. The money involved is usually more than most characters can afford. If it does not work the character is reduced to ashes and lost forever. If it does he may return to adventure anew — weakened and penniless.

Levels of ability

After returning from a foray, adventurers should go to the Adventurers' Inn. Here they may rest in a choice of rooms for as long as is needed to heal any wounds. A stay at the Inn will also tell you if a character has gained enough experience to become a character of the next level. If this is so, the character will gain things like strength, spell knowledge if applicable and may possibly lose points in one area. Characters of higher levels may attain such class distinctions as Ninja — an evil, inhuman fighting machine; Lord — the big hero; and Samurai, a super-fighter with some magical abilities.

It is characters of the higher levels who can venture deeper into the maze and find out how to go down onto different floors, where the monsters become more horrendous. Characters also encounter more and more interesting allies and richer treasures — getting further and further into the maze is where the fun and surprises lie . . .

User interface

Wizardry is an easy game to follow once you have looked at the manual and mugged up on what it's all about.

Usually you control the game with single letter commands, although this is inconsistently peppered with the use of Return. Characters are selected for the formation of a party by typing in their names and passwords if applicable. Thereafter they are assigned a number from one to six which is used instead of the whole name.

Before you enter the maze, all of the game is textual. But once in the maze you are given a graphic picture of where you are and where you can go. Monsters and pals you encounter along the way are also represented by little pictures. This makes it all the more fun, and if you encounter a dark area in the maze, you really feel as if what is before you is real and desperately critical

Conclusions

A recent conversation between two eminent computer journalists speculated on the possibility of the sale of very high level characters and maps of the maze. This is quite conceivable in such a complex and habit-forming game as this.

It is perhaps the deliciously grasping aspirations which drive players further and further into the abysses of the maze which make this game so compulsive. Frankly, if you don't like adventures you'll possibly never appreciate the finer points of Wizardry. If you do, it's like a great big pools win.

It's full of strange surprises — I have heard of terrible monsters and never come across them yet — and peculiar circumstances often befall the player. Working out the tricks the maze can play on you adds a touch of analytical spice to the whole proceeding.

I think I'll be playing Wizardry for a long time to come. This is surprising because I am a great cynic about adventures. Wizardry, though, has me in its thrall. It is imaginative, complex and above all downright frustrating until you get it right — then the almost lunatic sense of achievement is well worth all the trouble. Excuse me — I must get back to my Apple . . .

END

Availability and support

Wizardry is imported by a small company by the name of Woodland Software. Robin Hood, who runs Woodland, also distributes the package to retailers like Pete & Pam Computers. Woodland will supply Wizardry by mail order.

Sir-Tech Software supplies all software with a 30 day disk warranty, during which time all faulty disks will be replaced. Outside the warranty period, the old disk must be returned with a surcharge of $7 to cover the cost of new disk and postage. Woodland will do this for you for £5.

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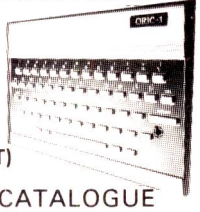

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WARNIER ORR PROGRAMMING

PART 2: SETS OF DATA

In Part Two of this four-part series Paul Overaa examines the relationship between program and data and elucidates the advantages of the Warnier diagram.

I have previously indicated how the Warnier diagram may be used to design and describe the logical layout of a computer program. The use of this diagram is not limited to program design but is also of practical value in describing the structure of data items themselves. The relationship between a program and its data plays a significant role in the development process and here I shall be dealing with the general ideas involved. For those of you who do not know the basic conventions of the Warnier diagram for program design, here are the essential details that you will need to understand its application to data sets.

The diagram consists of sets of brackets. Each bracket defines a set of actions or a particular subset of data. Underneath a particular action or data type there will be an indication of how many times the item occurs. Items within a particular bracket may be further subdivided and such subdivision is shown by a bracket written to the right of a data item name. Within each bracket the actions or data item details are read from top to bottom. In data structure diagrams the existence of 'brackets within brackets' indicates the occurrence of multiple sets of similar types of data items. In program design diagrams it is the existence of subroutines that are 'programmed once but called an appropriate number of times' that is implied.

Note: The basic conventions of the Warnier diagram have been dealt with previously (see *PCW* Oct 81, April 82, January & July 83). If you are unsure about some of the notation used, you should refer to the earlier works.

I shall start by examining some basic definitions. When a computer program is written, it is hoped or expected to do something. It will act on some input values and provide some useful information as output. By 'output' I am referring not just to VDU or printer output but to output in the sense of 'information passed'; such output of course includes data derived from one procedure that is passed on to become input to further procedures.

This description can be translated into a slightly more technical form. The collection of input items is nowadays called an 'input-set'. Similarly, the output items are collectively called the 'output-set'. The function of a computer program is to translate or 'map' the input set onto the output set. This is shown in Fig 1.

The area I now wish to examine more closely is the relationship between the input/output sets and the finished program.

To do this I have selected as an example a project in which I was involved several years ago. I have simplified the problem to a certain extent because the purpose of the exercise is to get across the underlying essentials rather than get 'bogged down' with technicalities peculiar to the example itself.

A London-based company of consulting analytical chemists, that I shall call company X, analyses many thousands of samples each year. The samples arrive from all over the world and represent commodities that are being bought and sold on the various commodity markets. Each sample requires various analytical tests to be carried out; these tests are not always the same because requirements vary according to different contractual obligations. The statistical information that can be collected by computer is obviously of great importance to the company and also to the trade in general. The problem given to me was to write the software to handle the collection, statistical reduction and the reporting of the information collected during the year.

Fig 2 shows the type of output that was required and it is in fact at this end of the problem that I shall start. (You may possibly be thinking that I should have considered the input items first but be patient and you'll see soon enough why it's important to look at the output set first.)

Each 'Commodity' in the report is subdivided into 'subsets' according to 'Origin'. For each Origin there is a further classification called 'Type'; this is a somewhat misleading term that actually relates to particular pre-treatments that a Commodity may have undergone — for example, some materials are sold as 'pellets'; some as 'chips'; some materials may have the oil in them removed by some extraction process . . . these are called 'Extractions'.

Within these classifications there are

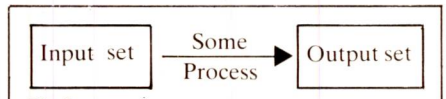

Fig 1

Commodity	Origin	Type	Tests	No Tested	Low	High	Ave	St Dev
Cereal-Replacer	Unclassified	Unclassified	Moisture	33	7.31	12.31	9.81	0.33
			Oil	14	1.79	6.50	4.14	0.29
			Protein	106	8.90	17.73	13.31	0.20
			Fibre	105	7.00	16.96	11.98	0.21
			Ash	98	7.66	11.55	9.61	0.40
			Sand–&/or–Silica	99	1.86	5.87	3.86	0.33
			Starch	66	26.45	36.87	31.66	0.21
Citrus-Pulp	Unclassified	Unclassified	Oil	68	1.78	2.29	2.03	0.40
			Protein	22	8.23	11.22	9.72	0.42
			Fibre	94	8.57	13.36	10.97	0.21
Copra	India	Extraction	Oil	96	0.76	3.20	1.98	0.35
			Protein	45	20.23	27.75	23.99	0.26
			Fibre	101	10.45	13.04	11.75	0.42
Copra	Indonesia	Extraction	Oil	8	4.04	15.28	9.66	0.32
			Protein	83	18.38	28.73	23.56	0.23
			Fibre	46	10.88	14.02	12.45	0.25
Copra	Indonesia	Expeller	Oil	78	1.04	6.58	3.81	0.38
			Protein	97	20.23	29.13	24.68	0.28
Copra	Ivory Coast	Extraction	Oil	20	1.21	2.79	2.00	0.34
			Protein	37	20.81	25.48	23.14	0.45
Copra	Kenya	Extraction	Moisture	21	6.86	11.13	8.99	0.22
			Oil	85	10.43	19.76	15.10	0.45
			Protein	88	17.99	25.15	21.57	0.36
			Fibre	12	8.43	10.22	9.33	0.34
			Sand–&/or–Silica	10	1.00	3.48	2.24	0.44
Copra	Mozambique	Expeller	Oil	42	8.59	15.35	11.97	0.27
			Protein	12	18.66	26.30	22.48	0.32

Fig 2

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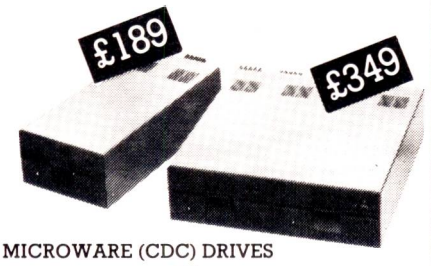

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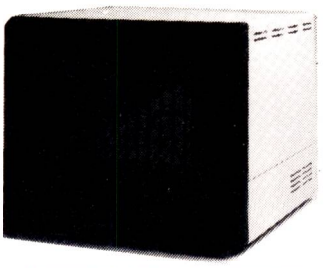

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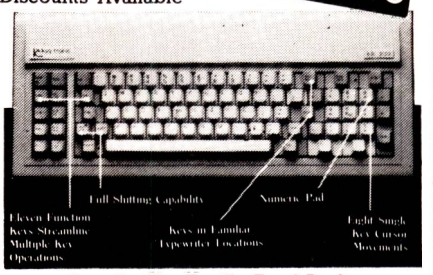

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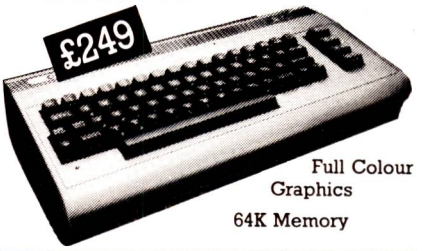

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WARNIER ORR PROGRAMMING

PART 2: SETS OF DATA

many different types of analytical tests that have been carried out. Each test has a name — for example, per cent moisture, and associated with each test there are statistical data that give the number of samples analysed for a particular Commodity-Origin-Type-Test combination; also given for such a combination is the lowest value found, the highest, the average value and the standard deviation. This last item simply measures the 'spread' or amount of variation of the analytical test results.

You will note from the above description and from examining the example page taken from the report in Fig 2 that this is a hierarchical subdivision. This may lead you to suspect that 'output set' can be represented by using a Warnier diagram. The example has been selected because the heirarchy is fairly obvious. Look at Fig 3 — this is the Warnier representation of the proposed report.

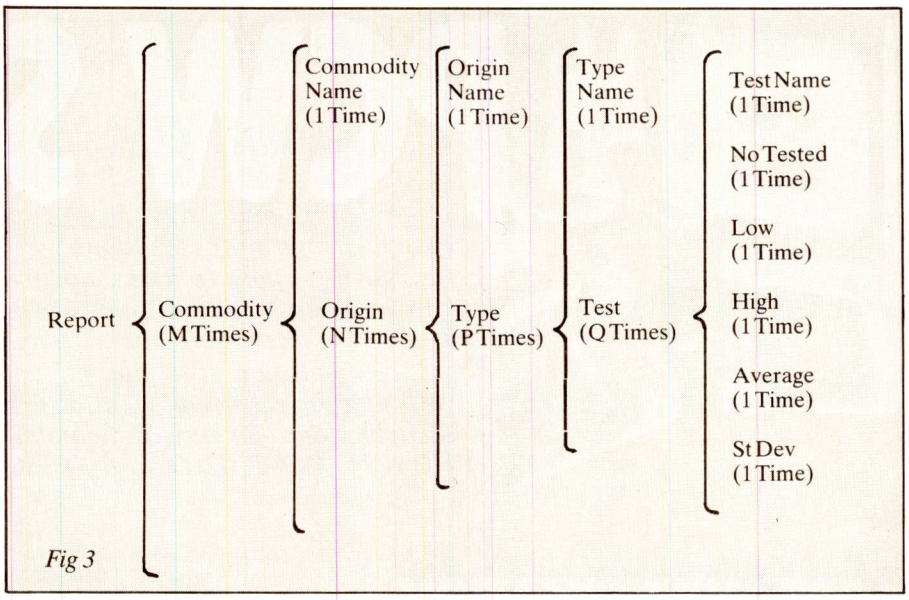


Fig 3

The representation reflects the logical ordering implied by the report being described. It is sometimes, therefore, called the logical file of output.

A review of the progress made shows that the problem has been outlined and the logical structure of the required output has been identified.

Items in the output file can be classed into two basic catagories:

1. Items that are collected by the program. I call these 'Primary Data Items' or 'Input Data'.
2. Items that are derived from Input Data Items. These I call 'Secondary Data Items' or 'Derived Data'.

The following data items necessary to produce the required output can now be identified.

Primary items — — —

a) Commodity Name
b) Country of Origin
c) Type (see definition earlier)
d) Analytical Test Name

Secondary or derived data items — — —

e) Number Tested — This item is the sum of all occurrences of a particular test for a particular Commodity-Origin-Type-Test combination. At present you only need to recognise that this can be obtained directly from the input data we shall store.

f) Lowest Value — Again, if all the individual sample data is available then, from a logical standpoint, we have access to or can identify, the lowest item for a particular Commodity-Origin-Type-Test combination.

g) Highest Value — Same applies as for Lowest value.

h) Average Value — This is the sum of the analysis results for a particular Commodity-Origin-Type-Test combination divided by the number of occurrences of the test.

i) Standard Deviation — This is computed from the analytical test data using the sum of the squares of the test results, the sums themselves and the number of occurrences. The point to note is that the data is available from the primary items listed above.

The above secondary items indicate that another rather obvious additional primary item needs to be considered. Its existence has already been implied: it is 'Analysis Test Result'.

The primary items will now be used to construct a logical input file. One more primary item needs to be added to the list and that is a 'Sample Identification Number'. Obviously there is no point in storing large amounts of analytical data if you can't identify to which customer samples it belongs. It's important to get one thing clear, though — the logical requirements of the problem do not actually need this identifier.

Let's list the Primary data item in its entirety just to complete things:
Sample Identifier, Commodity Name, Country of Origin, Type, Analytical Test Name, Analytical Test Result.

The Primary or Input items can be described using a Warnier diagram as in Fig 4. This shows the logical structure that exists for the input.

The representation in Fig 4 is straightforward. The Identifier, Commodity Name, Origin, and Type is collected for each sample, and then the name for the analytical test that has been carried out and the result obtained. Note in passing that what I have done is to subdivide the input set according to the frequency of occurrence of the primary data items. It is possible that the next stage in the development may come as a surprise. Look again at the 'Logical Input Structure', and now look at Fig 5: the Warnier description of the module to handle data input. The structures are identical. Look for example at the subgroup of actions which was isolated as 'Analytical Test'. This reveals that for 'T' tests the names and the results obtained are stored, that is, it suggests 'T'

GOTO page 205

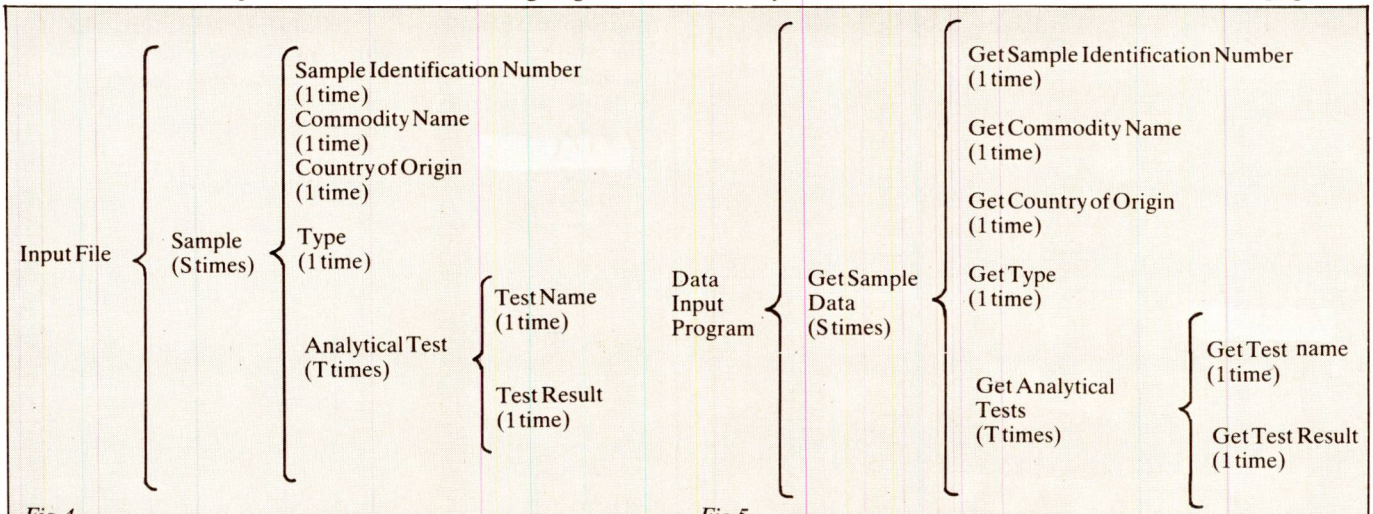
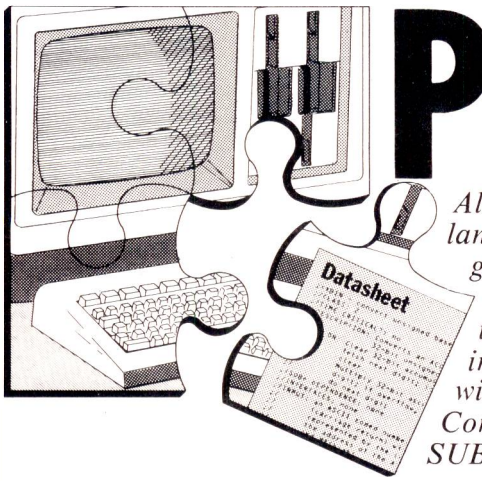


Fig 4 *Fig 5*



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6809 MULTIPLICATION

As this is written, June's Sub Set has only been out for a few days, so, while we are waiting to see how many 6809 machine-coders our June offering stirs into action, we present two more routines from Mike Kerry of Seaford. They are the multi-precision LMUL, which complements very nicely the 6809 multi-precision division, DIVNM (*PCW* September 1981) and UMUL, a limited precision routine but *very fast* (152 micro seconds on a 1 MHz 6809). Now if that doesn't bring some 6809 response, nothing will.

Noting that we do not yet have 6809 testing facilities, Mike recommends a Dragon and the Editor-Assembler 'Dream', which Dragon Data are about to market (and which Mike wrote!).

DATASHEET

```
;= LMUL - Multi-precision unsigned integer multiplication.
;/ CLASS: 1
;/ TIME CRITICAL?:  No
;/DESCRIPTION:  Computes the product of two unsigned binary
;/              integers giving a result up to 128 bytes long.
;/ ACTION:  Save registers, clear result.  Compute the products
;/          of every combination of 1 multiplicand and 1
;/          multiplier byte, and add into the result field,
;/          catering for any carry.  Restore registers, exit.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES:  Input multiplicand and multiplier fields in
;/              RAM or ROM.  Each input field is from 1 to 127
;/              bytes long.
;/ INPUT:  X points to the multiplicand.
;/         Y points to the multiplier.
;/         A contains multiplicand length (bytes).
;/         B contains multiplier length.
;/ OUTPUT:  U points to result field in RAM.
;/          The results field length is assumed to be equal to A + B.
;/ REGs USED:  None (all saved).
;/ STACK USE:  9
;/ LENGTH:  45
;/ PROCESSOR:  6809

LMUL:   PSHS   CC,D       ;save registers.              34 07
        ADDB   1,S        ;compute result length        EB 61
        DECB              ;-less 1.                     5A
LM2:    CLR    B,U        ;clear                        6F C5
        DECB              ;  result                     5A
        BPL    LM2        ;    field.                   2A FB
        DECA              ;get offset of low order      4A
                          ;multiplicand byte.
LM3:    LDB    2,S        ;offset of low order          E6 62
        DECB              ;multiplier byte.             5A
LM4:    PSHS   D,U        ;save offsets & pointer.      34 46
        LEAU   A,U        ;compute address for          33 C6
        LEAU   B,U        ;this partial result.         33 C5
        LDA    A,X        ;get multiplicand byte.       A6 86
        LDB    B,Y        ;get multiplier byte.         E6 A5
        MUL               ;compute 16-bit product.      3D
        ADDD   ,U         ;add into                     E3 C4
        STD    ,U         ; result field.               ED C4
        BCC    LM6        ;any carry ? - no             24 04
LM5:    INC    ,-U        ;- yes, adjust higher         6C C2
        BEQ    LM5        ;order bytes(s).              27 FC
LM6.    PULS   D,U        ;restore offsets & pointer.   35 46
        DECB              ;done all multiplicand bytes? 5A
        BPL    LM4        ;- no, get next.              2A E6
        DECA              ;done all multiplier?         4A
        BPL    LM3        ;- no, get next.              2A E0
        PULS   CC,D,PC    ;restore registers, exit.     35 87
```

DATASHEET

```
;= UMUL - Unsigned 16-bit integer multiply.
;/ CLASS: 2.  Position independent and re-entrant but does not
;/            save registers.
;/ TIME CRITICAL? No
;/ DESCRIPTION:  Multiplies two 16-bit integers giving 32-bit product.
;/ ACTION:  Compute and store high order 16-bit product.  Compute
;/          and store low order 16-bit product.  Compute each
;/          mid order product and add into result.  The 6 statements
;/          starting at label UM20 are used as an internal
;/          subroutine, as well as being executed in-line.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES:  Two 2-byte input fields holding multiplier
;/              and multiplicand.
;/              One 4-byte output field for the product.
;/ INPUT - X points to the multiplier.
;/         Y points to the multiplicand.
;/ OUTPUT:- U points to the product.
;/ REGs USED:  CC, D
;/ STACK USE:  4
;/ LENGTH: 34
;/ PROCESSOR:  6809

UMUL:   LDA    ,X         ;high order multiplier.      A6 84
        LDB    ,Y         ;high order multiplicand.    E6 A4
        MUL               ;                            3D
        STD    ,U         ;high order product.         ED C4
        LDA    1,X        ;low order multiplier.       A6 01
        LDB    1,Y        ;low order multiplicand.     E6 21
        MUL               ;                            3D
        STD    2,U        ;low order product.          ED 42
        LDA    ,X         ;high order multiplier.      A6 84
        LDB    1,Y        ;low order multiplicand.     E6 21
        BSR    UM20       ;compute product and         8D 04
                          ;add to the result.
        LDA    1,X        ;low order multiplier.       A6 01
        LDB    ,Y         ;high order multiplicand.    E6 A4
UM20:   MUL               ;                            3D
        ADDD   1,U        ;mid order result.           E3 41
        BCC    UM30       ;overflow to high order?     24 02
        INC    ,U         ;- yes, adjust               6C C4
UM30:   STD    1,U        ;restore mid order.          ED 41
        RTS               ;exit.                       39
```

ROOT EXTRACTION

Two misprints in John Kerr's lucid account of root extraction (*PCW* June) must be corrected for those of you still trying to puzzle it out. At the bottom of the first column on page 166, the previous equation becomes $(2s+d)^2 + q = 4x + y$, not $(2s+d)^2 + y$ and, two thirds of the way down the next column, virtual input $= 8x + y$, not $1 + y$.

Z80 STRING MOVE

Seán Leitch of Belfast has been secretly hoarding Sub Set routines on his CP/M system for some time now and has been using, and adding to them. He has now come into the open with a 30-page contribution, which we will be looking at from time to time. Seán uses Microsoft's Macro-80, which provides him with excellent facilities. But he has been having problems with the use of *common* areas and has had to remove them. He would like to know of anyone who has used *common* areas and solved all problems.

Here is Seán's routine, MSTRV, for moving strings, which he wrote for a suite of programs for keeping membership records.

DATASHEET

```
;= MSTRV - Move variable length string and spacefill.
;/ CLASS:  2
;/ TIME CRITICAL:  No.
;/ DESCRIPTION:  Move a string to a destination area.  If the
;/               destination area is longer than the string,
;/               spacefill.  If the destination area is shorter,
;/               truncate.
;/ ACTION:  Transfer bytes until end of string or count =0.
;/          If count =0 return, else store spaces until count =0.
;/ SUBr DEPENDENCE:  Local subroutine, L5.
;/ INTERFACES:  None
;/ INPUT:  HL = addr.  of source string whose last byte has bit 7 set.
;/         DE = addr. of destination area.
;/         BC = length of destination area.
;/ OUTPUT: HL = original contents of DE.
;/         DE = address of byte following destination area.
;/         BC = 0000H
;/ REGs USED:  BC, DE, HL
;/ STACK USE:  4
;/ Length:  45
;/ PROCESSOR:  Z80

MSTRV:  PUSH   DE         ;save original contents.     D5
L1:     BIT    7,(HL)     ;is bit 7 set?               CB 7E
        PUSH   AF         ;save flags.                 F5
```

```
        LDI             ;transfer, bump HL & DE, dec BC.        ED A0
        JP      PO,L4   ;if count = 0.                          E2 84 17
        POP     AF      ;restore flags.                         F1
        JR      Z,L1    ;if not the last input byte.            28 F5
        CALL    L5      ;remove bit 7 from last byte.           CD YY YY
        PUSH    AF      ;save accumulator.                      F5
        LD      A,20H   ;get space in A.                        3E 20
        LD      (DE),A  ;space destination.                     12
        LD      H,D     ;put address                            62
        LD      L,E     ;into HL.                               6B
        INC     DE      ;                                       13
        DEC     BC      ;for one space stored.                  0B
        LD      A,B     ;test                                   78
        OR      C       ;count                                  B1
        JR      Z,L2    ;and jump if now zero,                  28 02
        LDIR            ;else spacefill.                        ED B0
L2:     POP     AF      ;restore accumulator and                F1
L3:     POP     HL      ;original contents of DE                E1
        RET             ;and return.                            C9
L4:     POP     AF      ;                                       F1
        CALL    NZ,L5   ;only call if was last byte.            C4 YY YY
        JR      L3      ;                                       18 F8
L5:     DEC     DE      ;address of last byte transfd.          1B
        EX      DE,HL   ;into HL.                               EB
        RES     7,(HL)  ;clear bit 7 of last byte.              CB BE
        EX      DE,HL   ;                                       EB
        INC     DE      ;                                       13
        RET             ;                                       C9
```

THE ZERO OPTION

Indefatigable John Kerr of Glasgow and Conor O'Neill of Coulsdon have sent in routines to do the same job as David Heale's XYMOD (*PCW* April). Both contributors overcome the problem identified in XYMOD of altering program code by getting their routines to write a one-off subroutine in page zero using an opcode byte from the calling program and the 16-bit value in X and Y as the address operand.

First, John's routine RINXY at 41 bytes, minimum 71 T states and changing the contents of M1 to M4. (See Fig 1.)

```
RINXY:  PHP             ;save status                            08
        PHA             ;and accumulator                        48
        LDA     £$60    ;put RTS instruction                    A9 60
        STA     M4      ;in page zero after                     85 ZZ
        STX     M3      ;high order address                     86 ZZ
        TSX             ;index stack and                        BA
PAGE:   INX             ;increment (return address - 1)         E8
        INC     $0102,X ;to skip OPCODE on return               FE 02 01
        BEQ     PAGE    ;                                       F0 FA
        TSX             ;index stack and                        BA
        LDA     $0103,X ;copy new return address                BD 03 01
        STA     M1      ;into page zero                         85 ZZ
        LDA     $0104   ;to allow OPCODE                        BD 04 01
        STA     M2      ;to be copied from                      85 ZZ
        LDX     £0      ;its position after                     A2 00
        LDA     (M1,X)  ;JSR RINXY to                           A1 ZZ
        STA     M1      ;M1 followed by                         85 ZZ
        STY     M2      ;low order address                      84 ZZ
        LDX     M3      ;restore X, A and P                     A6 ZZ
        PLA             ;then jump to one-off                   68
        PLP             ;subroutine in page zero                28
        JMP     M1      ;perform OPCODE (XY).                   4C ZZ 00
```

Fig 1

And now Conor's XYMOD2 which retains the dummy 2-byte address field following the opcode. Conor is aware that this is unnecessary but has left it this way to improve program readability and for ease of assembly/disassembly. XYMOD2 is a trifle shorter and quicker at 40 bytes and a minimum of 60 T states but does change M0 to M6 and P. (See Fig 2.)

```
XYMOD2: STA     M0      ;save accumulator               85 ZZ
        PLA             ;pull return address            68
        STA     M5      ;off stack and store            85 ZZ
        PLA             ;in page zero for jump          68
        STA     M6      ;back to program                85 ZZ
        STY     M2      ;write address operand          84 ZZ
        STX     M3      ;to page zero                   86 ZZ
        LDY     £1      ;copy OPCODE from after         A0 01
        LDA     (M5),Y  ;JSR XYMOD2 to page zero        B1 ZZ
        STA     M1      ;before address field           85 ZZ
        LDA     M5      ;adjust return address          A5 ZZ
        CLC             ;for jump back to program       18
        ADC     £4      ;after dummy address field      69 04
        BCC     JAOK    ;                               90 02
        INC     M6      ;                               E6 ZZ
JAOK:   STA     M5      ;                               85 ZZ
        LDA     £$4C    ;write JMP instruction          A9 4C
        STA     M4      ;before jump back address       85 ZZ
        LDA     M0      ;restore A and Y and            A5 ZZ
        LDY     M2      ;jump to one-off routine        A4 ZZ
        JMP     M1      ;perform OPCODE (XY).           4C ZZ 00
```

Fig 2

The major difference to be found in the two routines is in the way that the programs generated by them return control to the calling program. XYMOD2 takes the return address off the stack and turns it into a JMP back to the calling program. RINXY leaves the return address, suitably adjusted, on stack and terminates the page zero program with RTS, a method which requires the use of less page zero memory. But consider what happens if OPCODE is $4C producing JMP (XY). In XYMOD2 the return jump is never used but in RINXY it is the RTS instruction which is not used and a stacking error occurs.

The concept behind RINXY and XYMOD2 is certainly thought provoking but is it a worthy subject? Leaving out CPX, CPY, LDX, LDY, STX and STY which are improbable uses of an (XY) operand, there are 17 instructions which may benefit from this extra addressing mode. However, eight of them can be programmed in only 4 bytes each — the number of bytes taken by JSR and the opcode byte without the dummy address field — and using only 2 page zero locations. If MO is initialised to and kept at a zero value then the two instruction sequences STX M1 : opc (MO), Y produce the effect of opc (XY) for opc: ADC, AND, CMP, EOR, LDA, ORA, SBC and STA.

It may be worthwhile doing a RINXY or XYMOD2 for the remaining nine instructions which cannot use the post-indexed indirect addressing mode but how often are X and Y used to hold a 16-bit address? If you have to put the address into page zero in order to use it, then why not have it there right from the start and leave X and Y free for their normal uses as loop counters and index registers.

One final thought prompted by these two routines: how long before Sub Set has to credit a computer program as a contributor?

PET PRINTER

Not a noisy, paper defacer from Commodore but a routine to print Program Embedded Text from Andrew Johnson of Winchester College.

The last time this neat idea graced Sub Set was in November 1981, when the 16-byte routine SAY did for the Z80 what Andrew's 31-byte routine TEXT now does for the 6502. SAY used the return address exchanged into HL to access the text following immediately after CALL SAY. Upon reaching an end of text character, SAY exchanged the return address, incremented past the embedded message, back to stack just in time for RET to use it.

The same method is used by TEXT except, of course, the 6502 does not have a direct equivalent of the Z80's HL register pair and EX (SP), HL instruction. The return address has to be moved into page zero for indexed addressing of the embedded message and moved back to stack at the end.

DATASHEET

```
;= TEXT - Print program embedded text.
;/ CLASS:  2 (changes register contents)
;/ TIME CRITICAL?:  No
;/ DESCRIPTION:  Prints message stored in the calling program
;/                immediately after JSR TEXT and ending with a nul (0).
;/ ACTION:  Move return address from stack to page zero.
;/  Increment return address and use it to fetch message byte.
;/  If byte is not zero then send it to a print routine and
;/  repeat the process, else put return address back and exit.
;/SUBr DEPENDENCE:  PRINT - Print character in A, not changing Y.
;/INTERFACES:  None
;/INPUT:  Text after JSR TEXT ending with a nul.
;/OUTPUT:  Text printed.  Return to instruction after text.
;/REGs USED:  A Y P M0 M1
;/STACK USE: -2
;/LENGTH:  31
;/TIME STATES:  45 + no. of chars. *(26 + PRINT time)
;/ PROCESSOR:  6502

TEXT:   PLA             ;pull return address from       68
        STA     M0      ;stack and put in page zero     85 ZZ
        PLA             ;for use as a pointer to the    68
        STA     M1      ;embedded text                  85 ZZ
        LDY     £0      ;clear index                    A0 00
TEXTLP: INC     M0      ;increment pointer to           E6 ZZ
        BNE     RDCH    ;next character                 D0 02
        INC     M1      ;                               E6 ZZ
RDCH:   LDA     (M0),Y  ;get next char. in A and        B1 ZZ
        BEQ     FINISH  ;end if it is a nul             F0 06
        JSR     PRINT   ;else go and print it           20 XX XX
        TYA             ;then go back                   98
        BEQ     TEXTLP  ;for the next character.        F0 F0
FINISH: LDA     M1      ;move incremented return        A5 ZZ
        PHA             ;address back to stack          48
        LDA     M0      ;and exit with                  A5 ZZ
        PHA             ;return to the instruction      48
        RTS             ;following the text.            60
```

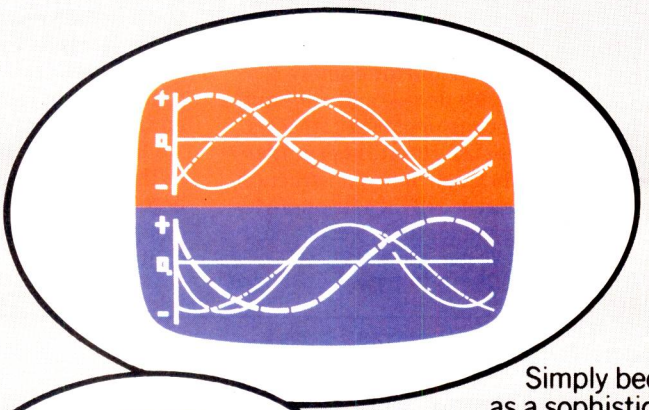
6502 SUPERSET

Along with TEXT, Andrew Johnson sent in page after page of unspecified 6502 instructions, far too many to give here.

It seems that the dear old 6502 achieves much of its speed by taking a rather cavalier attitude about the opcodes fed it, doing only enough decoding to ensure that it gets the specified instruction right.

Before we leave the subject, Mike Kerry disapproves of the amount of space afforded to 'undefined opcodes' and extra instruction simulations. He suggests that we all defect to the 6809 and live at peace with our programs.

For those that do,



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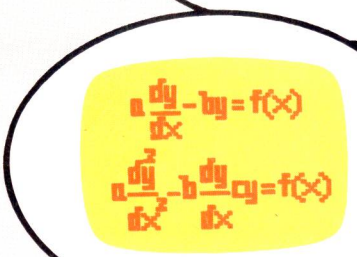
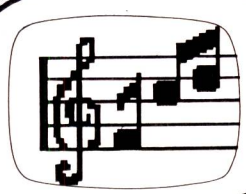
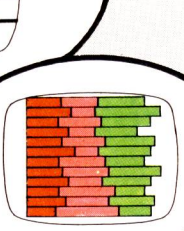
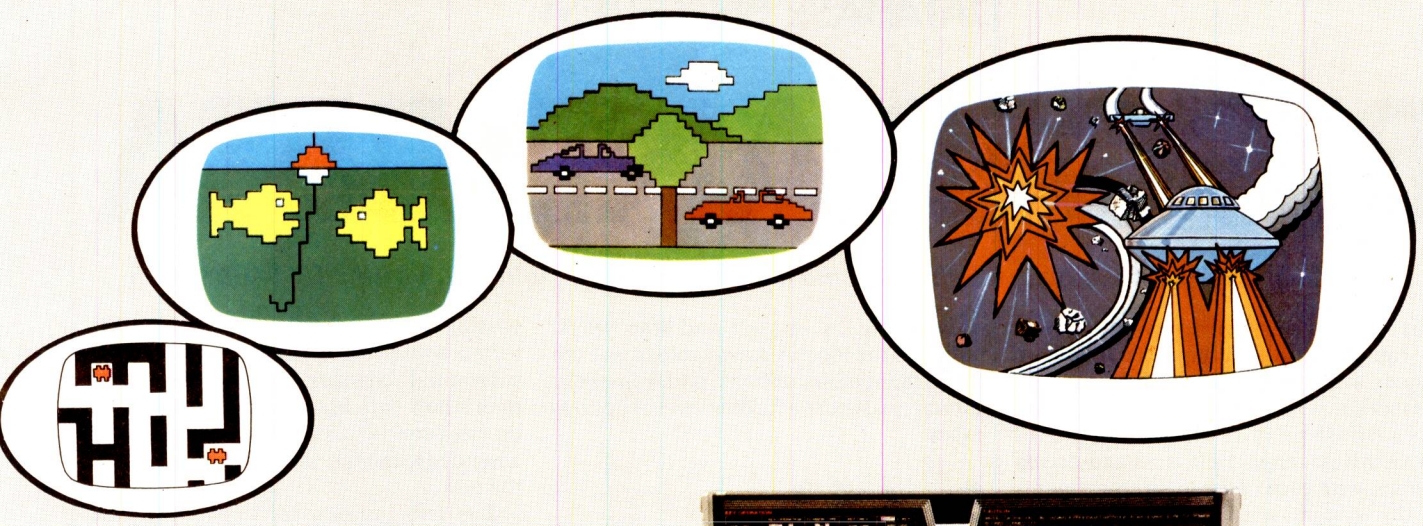






those that don't





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SOFTWARE
DATABASE BENCHTEST

BIGGER AND BETA

Kathy Lang takes a look at Beta, another data management package running under the UCSD-p system.

This month, I am again reviewing a system to run under the ubiquitous UCSD-p system, available on almost every micro on the market. The system is called Beta, and it is a British product which forms part of the OrmBeta range. Beta is a menu-driven system, with each of the main components of the system sensibly segmented into related groups of functions. The main menu is shown in Fig 1. The package uses single unrelated files to store data in fixed length records containing fixed length fields (that is, a particular field always uses its full space allocation even if that record contains no information). Two fields may be indexed; the primary index field must contain unique values, and may not be altered once the record has been stored. Indexes are, however, kept up-to-date automatically. Data can be input in a standard screen format or in a format designed by the user. Reporting, which may be either to the screen or the printer, includes an unusually flexible facility for including data items in running text, such as personalised letters. Beta has limited facilities for record selection, sorting and calculation, but these should be adequate for straightforward applications.

To give you a quick idea of the facilities of Beta, Fig 2 shows a 'Road Map' which indicates the functions available from each of the main menu options, and from these sub-menus where a further level of options exists.

1 Data Base updating and reporting
2 Data Base utilities and definitions
3 Transaction processing
4 Disk utilities
5 Text editor

Fig 2 Facilities available from Beta main menu

Constraints

Beta will run on any microcomputer which has the UCSD-p operating system. The main contraints of size and the wide variety of data types are shown in Fig 3. The major limitations are on the maximum number of fields (32), on numeric precision (two digits after the decimal point) and on numbers and sizes of key fields. The number of records allowed could also be rather limiting if full length key fields were used.

Max file size:	see max no records.
Max no records:	9999; further restricted if primary index used — max 5000 records for a 12-character key, max 3000 records for a 16-character key.
Max size record:	512 characters
Max no fields:	32
Max field size:	64 characters; 8 digits before decimal point, 2 after.
Max no index fields:	2 indexes, prime max 16 chars, secondary max 32 chars.
Max no sort fields:	11 chars when reporting, one field when sorting file.
Calculation limits:	5 fields in entry calculations, constants only when updating.
Field types:	character, numeric, date (day/month/year or month/day/year, logical, constant, calculated, per cent, table (up to 20 values — saves space).

File creation and indexing

A file is created by setting up a definition for each field which the file may contain, and then specifying the maximum number of records to be stored. The definition consists of the name and type of each field, and where appropriate (for character fields, for instance) the length. At this stage you may also specify the primary and secondary index fields. If no index fields are specified, then records are always accessed by record number. Once this definition has been set up and data has been added to the file, the structure of the records cannot be changed, though it is possible to alter field names and the formulae used for calculated fields. If more substantial changes become necessary, then a new data file definition must be set up (this can be copied from the first and amended), and the old data file copied into the new.

The two indexes are kept up-to-date automatically. But this is done by using an 'overflow area' of limited size when entering new records. When this becomes full the indexes have to be adjusted and the overflow area cleared out. How often this is necessary depends on both the frequency of updating and the size of the index fields. The package reserves 512 characters for the overflow area, and uses (length of primary index field plus two) characters in this area for each record added. So, for a key field length of 8 characters, you would need to clear the overflow once for every 51 records added. This process is carried out by the Index/Audit option on the 'Data Base Utilities and Definitions' sub-menu, that is, by a single action on the user's part.

Data input and amendment

Beta provides two methods of adding records to the file. The simple approach uses the Amend Record function in the Database Updating sub-menu. This displays the data fields on the screen, one per line and 16 per screen, and the fields are simply filled in sequentially down the screen. After each record has been added, you are returned to the sub-menu, and must choose the Add record option again to add another record.

The alternative approach is called Transaction Processing; in this mode the data is entered in a format pre-defined by the user, using a simple 'paint-a-screen' approach. This involves setting up fields across and down the screen by using the space bar and the return key to move the cursor to the required positions; no use is made of the cursor arrow keys. If you decide to amend positions, no backwards movement is provided other than back-space (which deletes the character behind the cursor). To make changes, you must finish entering the screen layout, respond

'N' when asked if the layout is correct, and use space and Return to get to the places where changes are needed. Field definitions may be modified only by deletion, by overtyping or by the insertion of spaces. However, it is possible to resequence the field display after the screen layout has been defined.

In transaction processing, you can restrict access so that records may be viewed only, deleted only, amended only, or added and amended. A password (up to ten characters) may also be assigned to a particular set of transactions. The number of sets of transactions which may be defined depends on several factors. Transaction processing is invoked from a menu designed by the user; the system can support up to twenty user-designed screen displays altogether, where a menu screen and a data screen each count one towards the twenty total.

Record amendment may be carried out by another option on the Update Database sub-menu. Alternatively, a modified form of amending records, called 'manual transactions', allows you to restrict amendment if desired to up to five fields, and to replace data items or to add amounts to numeric data items. In this form, the screen display can consist of up to five lines of identifying information about the record (primary index value, for instance) and a further five lines showing the data items which may be amended.

When adding records, they are identified by record number or by primary index value. For amendment, records may be retrieved by these values or by the secondary index value.

In addition to the interactive forms of updating, Beta provides an automatic update facility. This provides the ability to change or to recalculate item values; recalculation allows the usual arithmetic operators and constant values. So it is possible to increase a price by ten per cent, but not to add the value of one item within a record to that of another.

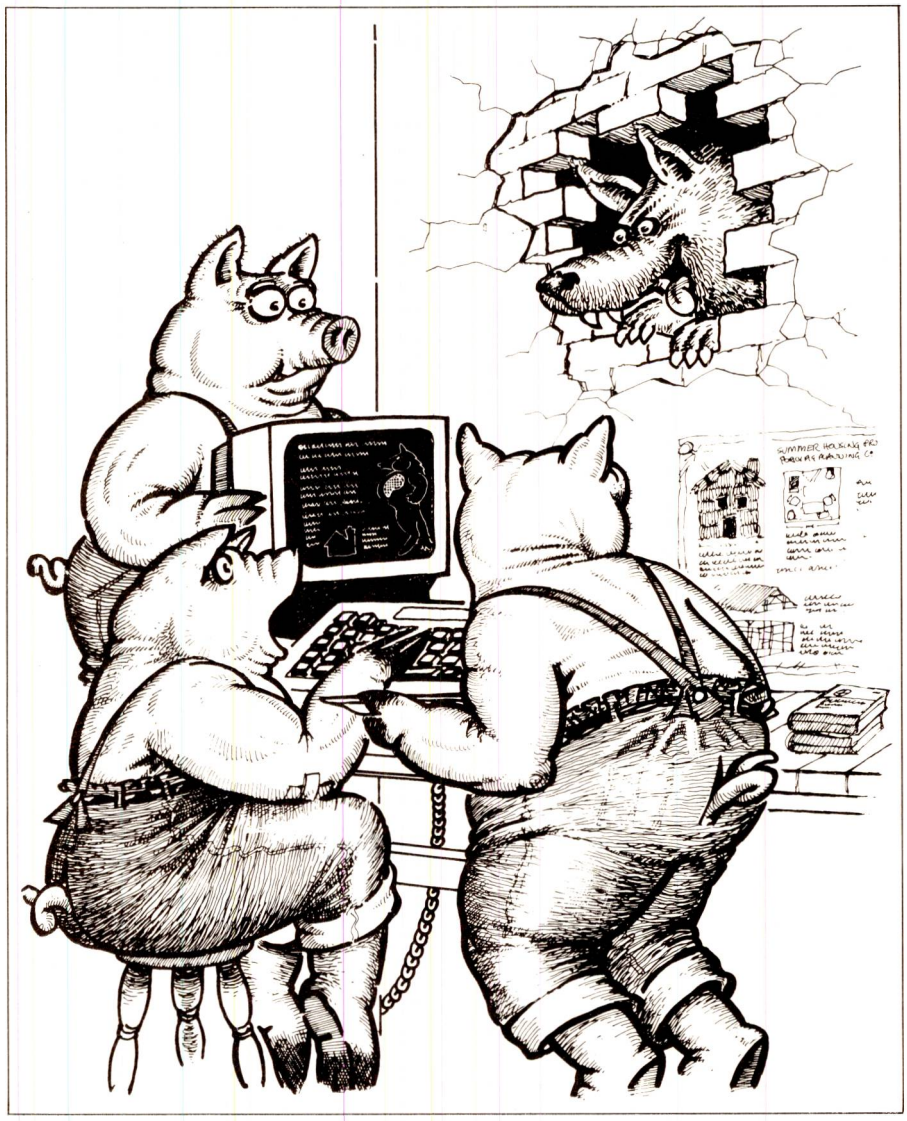
Screen display

Screen display during amendment can be of any of the three forms I've described — fixed display format with full amendment, fixed display format with limited amendment, transaction processing with user-defined screen format. When viewing records, you may use the first type of fixed format, or direct a report format to the screen as an alternative to the printer (see next section for report formats). When this is done, the screen display is halted each time a full screen is displayed, to allow viewing of the data.

Printed reports

The user can set up a maximum of eight report formats, and in addition there are special provisions for labels and for running text. In the report formats it is possible to specify sub-totalling and page-breaks when fields change — in each case these are of course only meaningful when the change fields have previously been sorted. Layout depends on the items specified for reporting. The items are printed in columns across the page, with each item value occupying a width appropriate to its allocated space in the data file — you do not have control over the layout yourself except to determine which variables will be reported upon and in what order.

More extensive control over layout is provided for labels and for material which is to form part of running text, such as standard letters. Here the facilities for including data items in text and specifying layout, formatting and printer instructions are quite flexible; most people would not need to use a separate word processor. For instance, unlike a number of packages, you do not have to set aside sufficient space for the data item in the text — Beta does that for you, and automatically 'wraps round' text onto the next line if necessary.



Data Base updating and reporting

1 Updating → add new record
2 Manual transactions → sub-menu — amend record
3 Automatic update → sub-menu — print record
4 Standard reports — delete record
5 Labels — duplicate record
6 Word processing — record search

Data Base utilities and definitions

1 Define new data base
2 Amend data base definition → sub-menu
3 Extract data base
4 Sort data base
5 Index/audit data base
6 Transaction processing definitions → user menu design and screen layout description sub-menu
7 Create new volume
8 Erase records
9 Data base utilities

Fig 3 'Road-Map' of main Beta menus

BIGGER AND BETA

Margins are set by commands embedded within the text file. Records to be processed through a text file may be selected through the mechanism described later under Selection, or dynamically via the primary index with the operator specifying key values.

A document which is to be printed using variable items from a data file is created either with Beta's own editor or with the system text editor. To those used to CP/M's ED, this won't sound like good news, but in fact the system editor is easy to use. Beta's own text editor is designed to be very simple to use, and thus has few commands and permits only insertion and deletion of characters and lines.

Calculation

Beta provides two types of calculation facility, in addition to the ability to sub-total fields on reports. Data items in records may be designated as calculated fields, in which case Beta stores the formula given, rather than keeping a calculated value in the record. This saves space, and ensures that values displayed are always consistent. Each calculation may consist of up to five elements, which may be either constants or data values from the same record occurring prior to the calculated field. Once records have been set up, calculations can be carried out automatically on a whole file, but only using constants. So you can, say, update a price by ten per cent, but you can't decide after a data file has been set up to store the results of calculations involving other data items. To do that, you would have to set up a new data file format including the new calculation, and copy the old file into the new using the 'Extract Data Base' function.

Selection

Records may be selected for viewing on the screen (not for amendment) or for printed reporting by specifying up to three fields for matching. Numbers may be matched either against a constant or a range of values. Matching on character fields is either of values containing the string to be matched, or of items starting with that string; in each case, the matching string may be up to ten characters long. If you specify more than one selection criterion, you can ask either for all criteria to be met, or for any one to be sufficient for the record to be selected.

Multiple files

Beta does not permit more than one data file to be processed at a time.

Tailoring

In the transaction processing part of Beta, it is possible to set up menus directing the operator round the various data input screens. I could not find any way to use these facilities to tailor other parts of Beta to particular applications.

Security and reliability

Beta provides several facilities for ensuring that people get only the data access they need. In transaction processing, password protection may be applied to each screen display. You can also apply protection to the data editing functions which may be performed — add, amend, delete, etc. It is also possible to request that each change to the data is recorded in an audit trail.

Sorting

Two methods of sorting are provided. If you need the data file itself sorted in a particular order, then you can sort it on one field (limited in length, according to the number of records in the file) and store the new data file. Alternatively, you may request that a report may be displayed or printed in a particular order, based on up to eleven characters from one or more fields. However, I couldn't find any way to use a substring facility, to allow, say, the first five characters of one field to be used with the first six of another, so this must be counted a very limited sorting facility.

Housekeeping

All the facilities you would be likely to want to perform by way of copying files and disks, listing directories and so on, are provided within Beta, except for disk formatting. However, there is a facility for you to hook into your system-specific disk formatting utility through Beta, which is a very sensible and surprisingly rare provision.

Links with outside

Within the main Beta package, you can neither write to nor read from files which other programs can access, so you can't, for instance, read in a file from a 'calc' package or write a set of names and addresses for a specialist mailing-list program to pick up. However, there is a set of Pascal routines which forms a library, available at an extra charge, which provides these facilities to people able to write their own programs. How easy people would find that would of course depend on their past experience. I'm not a Pascal expert, but I have done quite a lot of programming in several languages; when I used these utilities to create the Benchtest file, I found them not too difficult if rather tedious to use.

User image of the software

All the menus in Beta are in upper case, which I find difficult to read — I've got used to joined-up writing over the years — and rather intimidating *en masse*. In some circumstances, the package will only accept upper case responses when asking for Y or N. The menu system is completely hierarchical — there's no 'escape' to the top level, you just have to go back up through. Otherwise, there were a few minor irritations, but nothing serious.

Documentation

Like most package manuals, the Beta manual leaves a lot to be desired. It does provide a tutorial section, followed by reference sections, but there's no summary of the facilities, and I found it quite hard to find my way around the different menus. The 'road map' I showed in Fig 2 could very usefully have been provided in the manual. Again, like many manuals, Beta's is typewritten (in OCR-B script, I think) using plenty of space to make things easy to read — but hence making them hard to find. Seeing the wood for the trees is made no easier by the (customary, but still lamentable) lack of an index. Furthermore, though the manual is lucidly written, the authors clearly don't believe in any

BM1	Time to add 1 new field to each of 1000 records	16 mins 23 secs for 533 records*
BM2	Time to add 50 records interactively	2 sec/record
BM3	Time to add 50 records 'in a batch'	NT; possible but not usual
BM4	Time to access 50 records from 1000 sequentially selecting on one field	2 mins 10 secs + scrolling time
BM5	Time to access 50 records from 1000 by index on 25-character field	2 secs per record + scrolling
BM6	Time to index 1000 records on 25-character field	3 mins
BM7	Time to sort 1000 records on 5-character field	8 mins 40 secs + BM6
BM8	Time to calculate on 1 field per record and result in record	NA+
BM9	Time to total 3 fields over 1000 records	2 mins 40 secs
BM10	Time to import a file of 1000 records	56 mins + BM6

Notes: NT=Not Tested. NA=not available in this form. Time to replace one field in each record by a constant was 9 mins 10 secs. *Test failed with execution error after 533 records.

Fig 4 Benchmark times

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Brilliantly engineered daisy wheel typewriter/printer with self erase ribbon and extended keyboard in typewriter mode. Marvellous quality printing. Portable. RRP £485 + VAT.

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redundancy in the text, so one has to cross-refer quite a bit — and without much help from the text, and with no index, that becomes pretty tedious.

Conclusions

Beta provides a relatively simple, understandable approach to data management. The facilities vary quite a bit in their extensiveness; for instance, sorting and selection are quite limited, but the text processing facilities would allow you to do quite a lot of work which in many other packages would have to be passed over to a word processor. The transaction processing functions are quite powerful, and the 'housekeeping' facilities are more comprehensive than usual. On the other hand, some of the limitations on field size and indexing could be a real nuisance in some applications, as might be the inability to communicate with other programs such as 'calc' packages (unless you buy the utility package and write a Pascal program). Timing tests for Beta are shown in Fig 4.

If you already use UCSD-p, and want data management facilities under that system, then you should compare Beta with OMNIS, which I reviewed last month. If you don't mind which operating system you work under, then you should also compare Beta with other easily-used packages in the same price range, such as Personal Pearl, MicroPen, Cardbox, Rescue and the new Ashton-Tate offering, Friday!, before making up your mind. In the end, the choice will often come down to the package which comes nearest to your needs and on which you can get help from someone — your dealer or another user — to get going and when things go wrong.

END

Summary

Package type	Data management: single file, fixed length records.
Facilities	Simple menu-driven package. Two indexes plus record number for fast recall. Adequate columnar reporting, good textual reports, eg, circular letters.
Drawbacks	Limited sorting and selection. Changes to structure and max number records only by copying records out and back. Import and export only by programming. Need to reorganise index regularly when updating could be a nuisance, though quick.
Ease of use	Good, though no 'escape' to main menu from lower levels.
Error messages	Reasonably clear.
Documentation	Clear, but not very well presented or structured. No index or reference summary.
Costs (ex VAT)	£195 for Apple II; £295 for Sirius, IBM PC single user systems; includes 'hot-line' telephone support. Utilities for programming, eg, import and export £99/£150. Range of Beta-based packages for accounting, estate agents, membership records, etc.
Supplier	Ormskirk Computer Services. Tel (0695) 77043

PORTABLE COMPUTER WORLD

continued from page 163

led through its RS232 port which would be useful for data-logging applications. All of these interrupt modes can be enabled, disabled or masked with the ON,OFF and STOP statements, eg, TIME$ ON, COM STOP. To establish a priority order you would mask the other interrupts in the subroutine which serves the one with highest priority; if TIME$ STOP is placed in the COM servicing routine then Basic will remember any timer interrupt which occurs while ON COM is being served, and jump to its routine once COM is finished, assuming that you have re-enabled ON TIME$ with a TIME$ ON before returning. A powerful set of tools that allow tricks which would usually require assembler programming.

Editing of Basic programs is performed by TEXT which is called from within Basic by the EDIT command. In this instance key F8 returns to Basic rather than the Menu. Basic programs can be stored either in ASCII or in tokenised form and either form can be LOADed and run. It is therefore up to you whether to write Basic programs with TEXT directly, or write them from within Basic using EDIT in the familiar way. The snag is that TEXT can only handle ASCII text, and so when it is called up by EDIT the program in memory has to be detokenised and then retokenised when the edit is finished. This process can take up to two minutes for a large program, and in such a case it is wisest to edit the bare minimum number of lines at a time. I was irked to find that, as a result of this way of working, it is not possible to copy program lines by editing the line number as I am accustomed to doing; the original line will no longer exist. Another source of annoyance is the lack of either AUTO line numbering or RENUMBER which is pretty inexcusable nowadays. In fact, at risk of becoming a bore on the subject, I would have preferred a 'proper' interactive Basic screen editor; one that lets you edit direct mode commands as well as programs.

Documentation

The 200 page manual is quite clearly written and is nicely printed and bound with a large wire spiral binder that actually opens flat without ripping the pages. There is a first section of quick 'get-you-going' reference for each application, followed by individual chapters of deeper explanation on each. The rest of the book is devoted to the Basic with a good command summary that devotes several clear paragraphs to each keyword. There is an index at the back but it is not very comprehensive. There is very little tutorial material in the book; all of it assumes a fair level of familiarity with computing concepts. For instance, the section on TELCOM will not be very informative to anyone who knows nothing about communications. There are also a number of odd omissions which I hope will be corrected in later versions.

In short the manual is, as so often, adequate for the experienced computer user but of little use to the first time user.

Conclusions

At £495 for the 24k version the Tandy is good value for money compared to its main rivals in the 'book-size' class; the HP-75C and the Epson HX-20. Although it lacks the Epson's built-in printer and cassette deck, the provision of a good text editor and communications aim it directly at the corporate executive type of user who is so important in the USA. For such users a miniature printer is of little use compared to the ability to upload files to a desk-top machine and log on to information networks such as Dow-Jones. The lack of a portable printer will be felt more by the 'roving-salesman' class of user, which is I suspect rather more important in the UK. The large display puts the Model 100 well ahead of the field as a machine for word processing. Microsoft's software is well designed and easy to use and renders the machine useful straight out of the box; no mean consideration in these days when more software is promised than is delivered.

END

Prices

Model 100 (8k)	£499
Model 100 (24k)	£649
RAM 8k bit	£79.95
A/C adaptor	£7.95
Printer cable	£9.95

Benchmark timings

BM1	3.5
BM2	9.5
BM3	26.5
BM4	29.5
BM5	31.5
BM6	43.0
BM7	64.0
BM8	321.0

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

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C/WP's generous COMPLETE SYSTEM ASSURANCE scheme applies to every complete system sold by C/WP, including the modestly-priced Osborne 01.

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The lowest-priced Osborne system costs £1245. That includes the Osborne fitted with double density disk drives (200k each), and with Screenpac which allows it to display 80 characters in a line. The software includes CP/M M-Basic, C-Basic, WordStar, Mailmerge and Supercalc. On its own that software would cost you well over £1000.

But that's not all. The system price includes the STAR 510 (recommended price £289), a newly introduced 100 cps matrix printer, compatible with the Epson MX 80, but with many of the refinements of the FX 80. The Star is quiet and trouble-free and includes a 2.3k buffer.

This amazing package comes with C/WP COMPLETE SYSTEM ASSURANCE. Buy it with complete confidence, knowing that it is suitable for your purpose (or have your money back). Train yourself or your staff in WordStar or Supercalc at your privileged rate. And if anything does go wrong in the future rely on C/WP's hot-lines to get you out of trouble.

If this system doesn't fill the bill, let us suggest another. We can team Osborne up with daisy wheel printers or offer you a complete system around an Apple, a CORTEX or a SAGE computer.

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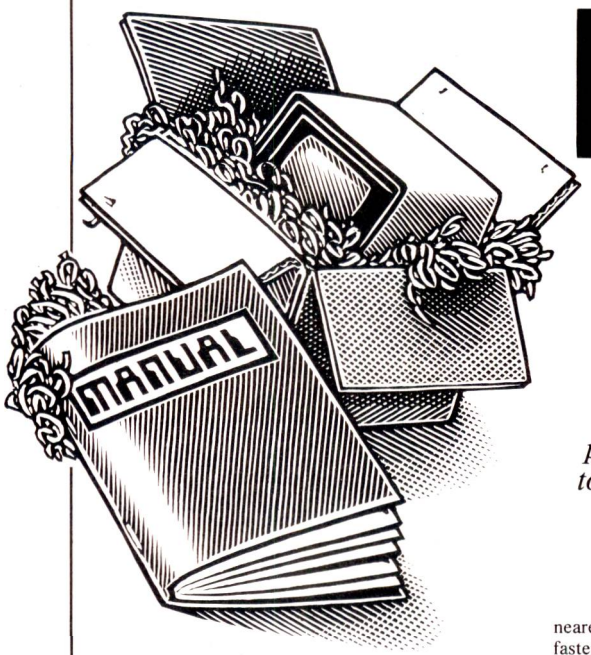


NEWCOMERS START HERE

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!*

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 if we had to continually say 'numbering system with a radix of 16 in which the letters A to F represent the values ten 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 the microcomputer's functions and then examine the physical components necessary to implement these functions.

The microcomputer is capable of receiving information, **processing** it, storing the results or sending them elsewhere. 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.** Binary is a system of numbering which uses base 2 instead of the more familiar decimal — or, to be more accurate, denary-system of base 10. In binary notation there are only two digits — 0 and 1 — which the computer recognises as the absence or presence of an electric current. The easiest way to visualise this is to think of each binary digit **(bit)** as being a switch which can be either off or on. Each binary digit stands for a power of 2. The right-most digit, the least significant, is $2^0=1$, the next $2^1=2$, then $2^2=4$, $2^3=8$, $2^4=16$, $2^5=32$, $2^6=64$, $2^7=128$, $2^8=256$. So decimal 24, for example, is represented in binary as 00011000. A set of eight bits is known as a **byte** and, to make things easier for humans, a third system of numbering, **hexadecimal** or **hex** for short, is used as a sort of 'halfway house' between binary and denary. Hex uses numbers to base 16, with denary numbers between 9 and 16 represented by the letters A-F. The hex equivalent of a byte is obtained by giving each half a single character code: 0=0000, 1=0001, 2=0010, 3=0011, 4=0100, 5=0101 ... E=1110 and F=111. Our example of 24 is therefore 18 in hex.

To simplify communication between computers, several standard coding systems exist, the most common being **ASCII** (American Standard Code for Information Interchange). This allocates a numerical code to each digit and letter. For example, the number 5 is given the ASCII code 35 hex, 53 decimal, whereas a capital A is represented by ASCII 41 hex, 65 decimal.

The computer processes data by reshuffling, performing arithmetic on, or by comparing it with other data. It's the latter function that gives a computer its apparent 'intelligence' — the ability to make decisions and to act upon them. It has to be given a set of rules in order to do this and, once again, these rules are stored in **memory** as bytes. The rules are called **programs** and while they can be input in binary or hex **(machine code** programming), the usual method is to have a special program which translates English or near-English into machine code. This speeds programming considerably; the nearer the **programming language** is to English, the faster the programming time. On the other hand, program execution speed tends to be slower.

The most common microcomputer language is **Basic.** Program instructions are typed in at the keyboard, to be coded and stored in the computer's memory. To **run** such a program the computer uses an **interpreter,** which is usually built into the machine's ROM (see later paragraph on this page). The interpreter picks up each Basic instruction, translates it into machine code and then feeds it to the **processor** for execution. It has to do this each time the same instruction has to be executed. A much faster method is to use a **compiler,** which accepts each instruction in turn, waits until the program has been entered, then turns each instruction into machine code before running the program. This means that each instruction has to be translated once only — consequently the speed of execution is considerably improved.

Two strange words you will hear in connection with Basic are **PEEK** and **POKE.** They give the programmer access to the memory of the machine. It's possible to read (PEEK) the contents of a byte in the computer 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 PCB 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. Not surprisingly, 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. You can buy special ROMs called **PROMs** (Programmable ROMs) and **EPROMs** (Erasable PROMs) which can be programmed using a special device; EPROMs can be erased using ultra-violet light.

Because RAM loses its contents when power is switched off, **cassettes** and **floppy disks** are used to save programs and data for later use. Audio-type tape recorders are often used by converting data to a series of audio tones and recording them; later the computer can listen to these same tones and re-convert them into data. Various methods are used for this, so a cassette recorded by one make of computer won't necessarily work on another make. It takes a long time to record and play back information and it's difficult to locate one specific item among a whole mass of information on a cassette; therefore, to overcome these problems, **floppy disks** are used on more sophisticated systems.

A floppy disk is made of thin plastic, coated with a magnetic recording surface rather like that used on tape. The disk, in its protective envelope, is placed in a disk drive which rotates it and moves a **read/write head** across the disk's surface. The disk is divided into concentric rings called **tracks,** each of which is in turn subdivided into **sectors.** Using a program called a **disk operating system,** the computer keeps track of exactly where information is on the disk and it can get to any item of data by moving the head to the appropriate track and then waiting for the right sector to come round. Two methods are used to tell the computer where on a track each sector starts: **soft sectoring** where special signals are recorded on the surface, and **hard sectoring** where holes are punched through the disk around the central hole, one per sector.

Half-way between cassettes and disks is the **stringy floppy** — a miniature continuous loop tape cartridge, faster than a cassette but cheaper than a disk system. **Hard disk** systems are also available for microcomputers; they store more information than floppy disks, are more reliable and information can be transferred to and from them much more quickly.

You, the user, must be able to communicate with the computer and the generally accepted minimum for this is the visual display unit **(VDU),** which looks like a TV screen with a typewriter-style **keyboard;** sometimes these are built into the system, sometimes they're separate. If you want a written record **(hard copy)** of the computer's output, you'll need a **printer.**

The computer can send out and receive information in two forms — **parallel** and **serial.** Parallel input/output **(I/O)** requires a series of wires to connect the computer to another device, such as a printer, and it sends out data a byte at a time, with a separate wire carrying each bit. 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 bytes being sent per second.

The 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 popular.

Finally, a **modem** connects a computer, via a serial interface, to the telephone system, allowing two computers with modems to exchange information. A modem must be wired into the telephone system and you need British Telecom's permission; instead you could use an **acoustic coupler,** which has two obscene-looking rubber cups into which the handset fits, and which has no electrical connection with the phone system — British Telecom isn't so uppity about the use of these.

GET TO KNOW CORTEX-
really THE VERY FRIENDLY COMPUTER

TEN FINGER EXERCISE

You'll be amazed how simple word processing is with CORTEX'S new version of WordStar. No more fumbling with messy key sequences.



CORTEX has 10 special keys to give 40 commands. This is ERASE. Hit it and a letter disappears. Hit SHIFT ERASE and a word goes. Press CONTROL ERASE and the whole line is demolished. It's as easy as that. And it's free! CORTEX's £1495 price includes a copy of C/WP's WordStar 3.3.

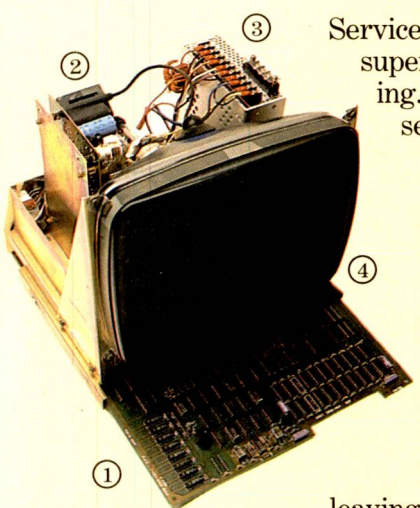
AS BRIGHT AS A BUTTON



Actual photograph

The twin-processor 104k CORTEX is not only smart in performance (faster in benchmark tests than Sirius or IBM-PC) – its appearance takes some beating too. Examine its slim, but solid 83-key IBM-style keyboard. Admire its bold clear 12-inch screen, set in a minimal-sized cabinet. "But where is the computer?", we are often asked. It's there in the same small cabinet, lying flat across the bottom, screened from interference and cooled naturally, without the whine of a fan. CORTEX has been designed not to dominate your desk, to leave room for your calendar, your telephone, your in-tray and the rest. If you want it inconspicuous, buy it in conventional cream. But for the extroverts, and the fashion conscious, CORTEX comes in bright, bright colours – warm red, C/WP green, sunshine yellow, ice white and all black.

A FRIEND IN THE NUDE



Service men love CORTEX's superb modular engineering. (Yes, you can get service anywhere in Britain.) If anything goes wrong (which won't be often) he undoes four screws and the computer (1) slides out like a drawer. A few seconds work and the video electronics (2) slip out, or the power supply (3), leaving only the "bottle" (4). CORTEX is your friend because it's reliable. And, if it goes wrong, it's easier and quicker to mend.

FASTEST DRAW IN ITS CLASS



Actual photograph

It's unfair on other micros. For CORTEX has a dedicated "second computer" (as powerful as Apple II) which does nothing but handle its screen. That's why CORTEX has such dazzling quick-fire graphics. Now CORTEX's superb graphics hardware is matched with Digital Research's CP/M Graphics software (£275). Creat bar charts, pie charts, scatter graphs in a few seconds and incorporate them into your reports or display them 2, 3 or 4 at a time on your screen. or make overhead projector or conventional slides.

C/WP CORTEX

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ALL THIS FOR £1495 + VAT

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YANKEE DOODLES



Sol Libes presents his monthly batch of juicy snippets from the Big Apple.

Random rumours

There are rumours that Microsoft is now beta testing version 3.0 of MS-DOS and that it may be available as early as October. It is expected that the new version will have multi-tasking ability à la Concurrent CP/M-86 . . . Meanwhile Digital Research is expected to release a new version of CP/M-86 by the end of the year which will include many of the new features included in CP/M-80 Plus (Version 3) . . . Hewlett-Packard is expected to introduce a system, running MS-DOS into an already crowded IBM PC compatible market . . . Rumours continue that the Shugart division of Xerox is up for sale . . . Xerox is apparently readying a four-pound battery-powered portable computer . . . USI International Corp, Taiwan, is expected to introduce a 'joy mouse' cursor control device for use with home computers with an expected retail price of under $10 . . . Sharp Electronics is rumoured ready to start sampling a 16 line x 80 character liquid crystal display this summer. The company has already demonstrated a prototype 24 line x 80 character display . . . Commodore's under $3000 Lisa-like machine is expected before year end. The word is that Digital Research is doing the operating system for Commodore . . . Sord Computer Systems Inc is expected shortly to introduce a portable for $190 based on the Z80 with 250k RAM.

Micro Unix News

At the recent National Computer Conference 45 new Unix-based microcomputers were being demonstrated with about 80 per cent based on the Motorola 68000 microprocessor. At the show Western Electric announced that agreements had been signed with Intel, Motorola and National Semiconductor to license Unix version 5 and provide support to these vendors. WE is also expected to sign a contract with Zilog.

Tandy announced that it will furnish Microsoft's Xenix to all past, present and future purchasers of the Tandy 16 system at no extra charge. Thus if all of these users were to use Xenix on their systems there would be 15,000 additional Unix systems in operation, more than doubling the number of Unix systems in operation and making Xenix the most widely implemented version of Unix. Of course, if only a few Tandy 16 users use it, that is another matter. With Xenix on the Tandy 16 a three-user timesharing system can be implemented.

Apple doings

Apple Computer is continuing an aggressive fight against Apple clones. In its latest battle it was successful in obtaining an injunction against Formula International, Los Angeles, California, to halt the sale of its 'Pineapple' kit. This is the first such injunction Apple has received against a domestic supplier. The Pineapple's components were actually made in Hong Kong. The judge in the case concluded that FI had violated copyright laws by copying Apple's ROM and disk-based software. Apple is presenting its suit also charging patent and trademark violations. FI is appealing and in the meantime has changed the name of the system to 'Pinecom' and is furnishing a new ROM. The system sells for half the price of the Apple IIe.

FI has also announced that it will soon introduce an IBM PC look-alike.

Apple, which has as yet not delivered any Lisa systems to customers (although many dealers have their demo units), has disclosed that it has already accepted orders for the McIntosh, the lower-priced Lisa look-alike. The orders, which already total close to 20,000 units have been accepted from universities which will require their students to purchase the systems. Deliveries of the unit are expected this fall. First shipments of Lisas to end users are expected this summer.

Apple has disclosed that orders for the Lisa are well ahead of what was expected and that the Lisa should be in short supply until the second quarter of next year.

Big blue news

The new IBM PC XT model has met with such success that IBM has fallen up to six weeks behind in deliveries to dealers. The result is that IBM look-alike competitors have seen a tremendous boost in sales. The prime beneficiary of the XT shortage has been Compaq Computer Corp whose unit is now also in short supply.

Dealers are also claiming that the supply of PC-DOS version 2.0 is even more of a problem. Many dealers are resorting to making copies of the system disk so that they can deliver PCs to customers. They will then supply the manuals when they come in.

Price war intensifies

Tandy finally entered the home computer pricing war with a new version of its Colour computer having only 4k of RAM (expandable to 20k) and selling for $150.

Texas Instruments countered by introducing its $100 rebate on the 99/4 two weeks earlier than scheduled thus bringing the street price down to well under $90. Further, TI is now giving away its $249 expansion box with the purchase of any three of its peripheral devices. This is the first time that a supplier has cut prices on a peripheral device, which is usually where it makes up for the profit lost on the computer. Also TI is expected shortly to unveil new lower-priced peripherals and two new versions of the 99/4 and a new 'top-of-the-line' model called the 99/8.

Timex, which ironically spearheaded the price war by cutting the price of its TS/100 (Sinclair ZX81), has decided to pull back the TS/2000 (Sinclair Spectrum) which it had already announced with a suggested selling price of $149 (16k RAM) and added features to it so as to be able to meet competition. The new 200 will have banked memory, an expanded 64x24 display, a ROM port for plug-in software cartridges and an upper/lower case keyboard. Timex will also introduce a new machine, to fit between the 1000 and 2000, called the TS/1500, with a suggested list price of $79.

The unit will be similar to the Spectrum with ROM port and compatibility with TS/1000 software and will be made in South Korea.

The Timex 1000, which a year ago was selling for $99, is currently selling for $39.

And Atari has announced that it will market software for the Commodore, TI, Radio Shack, IBM PC and Apple computers. Atari is also expected to introduce its long rumoured upgrades of the 400 and 800 machines to be called the 600XL and 800XL. The 600XL will finally have a raised keyboard and 16k RAM and list at $150. The new 800 will come with 64k RAM and list at about $300. Atari is also expected to introduce a new top-of-the line computer to be called the 1400XL and 1450XL. The 1450 is expected to have a built-in disk drive, modem, speech chip and 64k RAM. The 1400 should be the same as the 1450 less disk drive. The 1450's list price is expected to be about $800. In the meantime, Atari has reported a second quarter

YANKEE DOODLES

loss (its second in a row), merged its game and computer divisions and laid off another 225 employees (it laid off 1700 just three months ago).

The Commodore VIC-20 still appears to be the leading seller in the colour home computer market now selling for under $80; and Atari's recent rebate on the 400 has brought its price down to less than $95.

New portables introduced

Commodore showed off its new $995 portable called the 'Executive 64' with a six-inch CRT colour display, 64k RAM and 170k disk drive. However, at 25lbs is it really a 'portable' machine?.

Three true portables were introduced by Gavilan, Sharp and MicroOffice Systems Technology. The Gavilan unit weighs 9lbs, is battery operated and has built-in software and disk drive. The 8 line × 66 character display has an associated touch pad that acts like a mouse and gives the unit many Lisa-like features. The unit uses an 8088 microprocessor with 128k RAM and MS-DOS is also furnished. The price will be approximately $4000.

The new Sharp portable features an 8 line × 80 character display, 128k RAM, a bubble memory, an 8088 processor, and will retail for $2500. The MST unit will be under £2000 and feature an 8 line × 80 character display and the NCS800 CMOS processor running CP/M. Apple and IBM are expected to introduce portables by year-end.

Disk technology trends

At the recent National Computer Conference the trend was for lower profile winchester hard disk drives for the emerging desk-top and portable markets. Several vendors also showed micro-winchester (sub 5.25in) drives. Control Data Corp and Rodime introduced 3.5in winchester drives with the same form factor as the floppy disk drives from Sony, Shugart and Tandon. The CDC drive stores 6.38 Mbytes (unformatted) with production expected by the end of the year. The firm is working on 12 and 19 Mbytes versions.

Syquest, the first firm to introduce a sub 5.25in hard disk (3.9in), disclosed that it will soon introduce 10 and 20 Mbytes versions of its drive. Computer Memories Inc, Tandon Corp, Miniscribe and Shugart all showed half-height 5.25in winchesters.

In the floppy area Sony introduced a 1 Mbyte version of its 3.5in drive; Amlyn Corp showed a 5.25in floppy storing 3.3 Mbytes and Kodak showed off a prototype 5.25in floppy drive storing up to 10 Mbytes.

On the optical memory front Panasonic demonstrated its 8in disk storing 700 Megabytes and Control Data showed off a 12in optical disk system.

Commodore fined by FCC

Commodore Business Machines has been fined $4000 by the Federal Communications Commission for violating the Radio Interference Standards. The FCC, which recently began policing retail stores, claimed that the new P500 computer and 8023P printer lacked compliance with the Commission's regulations.

Lower supply voltages proposed

The JEDEC JC-42 memory committee has proposed lowering power supply voltages for logic circuits from the current 5V level to 3.3V for devices powered by regulated supplies and 2.8V for battery-powered devices. The reasoning is that the newer devices continue to be scaled down and IC designers are concerned that the thinner oxides and reduced lateral dimensions will not be able to withstand the electric field stress imposed by 5V power supplies. 3.3V devices could still interface with 5V devices without buffering, allowing the mixing of TTL and low-voltage devices in a system. The 2.8V devices would match the end-of-discharge levels for many batteries and the lower operating supply limit of high performance CMOS devices.

The proposed standard has already been approved by the JEDEC, MOS and bipolar memory standards committees and is under review by the JEDEC gate-array, bipolar logic and MOS logic committees.

Smalltalk released by Xerox

The much talked about Smalltalk, the integrated language and operating system, developed by Xerox at its Palo Alto Research Center over a ten year period, has finally made its debut. Xerox will now be offering commercial licences ($20,000) and university licences ($400). System manufacturers who install Smalltalk on their systems will have to pay a $150 per system licence fee. Called 'Smalltalk-80' it includes text, graphics and program editors and a large number of utilities.

Japan taking the lead

Several top US computer experts are predicting that programs initiated by the Japanese will make Japan the computing leader within ten years. They claim that Japan is using a similar strategy to that which boosted it into becoming the leading power in the automobile industry. They claim that Japanese government sponsored development projects in artificial intelligence, computer-aided design and manufacturing and large-scale numeric processors are readying Japan to make great strides in almost every area of computer technology.

They claim that US computer manufacturers are too concerned with yearly profits and pass up opportunities for future technological developments. Also, US companies are unwilling to share results of their research and hence many developments go unused. They pointed to a lack of directed US technology research programs and they expressed the view that the US may already be in trouble in the supercomputer or large scale number crunching market.

IBM and Digital Equipment Corp have undertaken a joint venture to establish a networking system at Massachusetts Institute of Technology consisting of 63 DEC minicomputers and several thousand DEC and IBM personal computers acting as work stations. MIT will develop the software with DEC and IBM taking care of the hardware. This is the first instance in which the two giants of US computing have ever cooperated on a project or attempted to make their equipment compatible.

Random news bits

Fujitsu appears to be the first manufacturer to introduce a system (its 8/16 microcomputer) with 256k memory chips. Naturally it uses Fujitsu's own memory chips . . . Visicorp has now pushed back delivery of the VisiOn system for the IBM PC until October (although December appears to be more realistic) and announced a price of $495. The mouse will be an extra $250 and the spreadsheet, word processor and graphics packages will cost users an extra $395, $375 and $195 . . . Mattel Electronics has filed a suit against Atari for $40 million alleging 'misappropriation of trade secrets, unfair competition and inducing breach of contract' when it lured away three programmers who were working on Intellivision games . . . VisiCalc, for over two years the most popular spreadsheet program, has been overtaken by Microsoft's MultiPlan and Lotus Development's 1-2-3, both of which offer improvements over VisiCalc. The leading word processor program is still MicroPro's WordStar. However, it may soon be overtaken by products which are easier to use and offer the same features . . . Condesin Inc, Fremont, California, is reported working on development of non-volatile IC RAM chips storing four Mbits PC compatible machine with 128k RAM and 160k disk.

END

PINPOINTING THE PROBLEM
GRAPH PLOTTING ON THE BBC MICRO

'How's that for a good fit?' David Angier and Amselm Kuhn take a closer look at presenting data by graph plotting and curve fitting using the BBC micro.

Ever since science began to get serious, it has been recognised that by presenting data in a graphical form, a much better understanding of it can be obtained. Furthermore, the form of the graph allows all sorts of deductions (especially when it is a straight line). There are also benefits of interpolation (prediction of intermediate values) and extrapolation (prediction of values outside the actual range of the experiment).

So it should be a reflex reaction for scientists, on obtaining their data (usually in the form of X,Y pairs) to plot it. It is not only scientists who have come to value the graphical method of data presentation, but engineers, economists, sociologists and businessmen, too. Until the arrival of the computer, it was normal to draw a smooth curve through the points and leave it at that. Even for straight line data, calculation of the line of best fit was a procedure so complex that it was very rarely attempted.

So how did the advent of the micro change all this? The answer is 'surprisingly little'. For over five years now, there have been a number of books (see below) containing program listings in a very transportable form of Basic for jobs such as straight-line fitting, or other mathematical functions such as:

$Y = Ae^{bX}$
$Y = A + BX + CX^2 \ldots NX^n$

which fitted data to these equations, printed out goodness of fit and also allowed interpolation. But — and this was the price of their 'transportability' — none of these readily available listings enabled the user to see, still less obtain, hard-copy of the data in graphic form. Using the methods in such a form was like working blindfold, and though a high scoring 'goodness of fit' percentage was comforting, it meant very little. The common end result was to leave the keyboard with a clutch of, say, '99 per cent fit' X,Y values and plot them, only to find that the function fitted to those figures looked ludicrous and had no meaning in physical terms. It would often shoot off to plainly ridiculous values only a short distance outside the actual span of experimental X,Y values.

The harsh fact of the matter is that a single figure, such as the goodness of fit, is not and never can be a substitute for a display of the actual data points. It is essential to have a graph-plotting routine that can be used in conjunction with a curve-fitting suite of programs. This has long been available on larger machines, and the GINO-F package (a version of which can be implemented on some micros such as Research Machines) is a superb plotting routine. But all too often, larger machines (such as those at most universities and polytechnics) are not capable of operation by the user in an interactive mode. The user inserts his data and has to wait for the results to arrive back, when what he would prefer is to sit at the keyboard and manipulate the fitting function.

The program for doing this is described below.

Preliminary inspection of data

The only really satisfactory procedure is to inspect the data before committing oneself to a given form of curve fit, and the X,Y data points must be available for fitting to more than a single mathematical inspection. A preliminary inspection of data then may enable us to consider (or eliminate) many types of X,Y relationship, in order to make an informed guess as to the most suitable curve-fitting routine. Fig 1 shows two sets of data. One is clearly a candidate for straight line treatment, the second might best be fitted by a function such as the polynomial. We see at once that neither function passes through the origin and so we do not waste time on functions such as the single power fit:

$Y = aX^b$.

The second piece of important information to be extracted from a preliminary inspection of data relates to monotonic functions on one hand (those in which the sign of the slope does not change, or which possess no maxima or minima) while more complex functions will display such phenomena. Broadly speaking, we shall need at least a two term function to model such complex data, in which the first term dominates over part of the data range, the second over the rest of it. Given these preliminary thoughts to guide us, it remains only to select the most suitable functions and see how they fit.

Straight line plots

These are the most commonly found plots, and indeed most scientists will endeavour to cast their data into a form giving such a relationship.

All the commonly found program list-

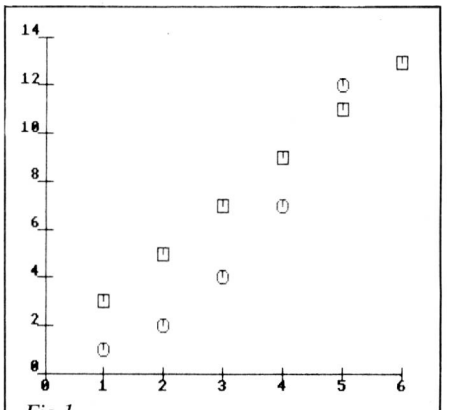


Fig 1

```
  100*FX5,2
  200*FX8,3
  300R$=CHR$(13)
  400S$="S9":GOSUB13900
  500MODE7
  600VDU23;8202;0;0;0;
  700 DATA "1","2","3","4","5","6","7","8","9","0"
  800 DIM P(1,30),F$(35),F(10),A(30),X(32),Y(32),A1(30),B(30),C(30),D(31),V(30),
W(30)
  900GOTO9500
 1000PRINTTAB(3,4);CHR$132;CHR$141;"This is the B.B.C. version of"
 1100PRINTTAB(3,5);CHR$132;CHR$141;"This is the B.B.C. version of"
 1200PRINTTAB(9,7);CHR$130;CHR$141;"THE CUBIC SPLINE"
 1300PRINTTAB(9,8);CHR$130;CHR$141;"THE CUBIC SPLINE"
 1400PRINTTAB(14,10);CHR$(129);CHR$(141);"Program"
 1500PRINTTAB(14,11);CHR$(129);CHR$141;"Program"
 1600PRINTTAB(2,20);CHR$136;CHR$133;"Press the SPACE BAR to continue"
 1700FORZ=255 TO 50 STEP-4
 1800SOUND1,-11,Z,1
 1900SOUND2,-11,Z-6,1
 2000NEXT
 2100FORZ=50 TO 249 STEP4
 2200SOUND1,-15,Z,1
 2300SOUND2,-15,Z+6,1
 2400NEXT
 2500A$=GET$
 2600MODE1
 2700RETURN
 2800 FOR J9=1 TO F(3):F$(J9)=" ":NEXT:IFF(2)>F(3)-2THEN 4400
 2900F(2)=ABS(INT(F(2)+.5)):F(4)=F(3)-F(2):F(5)=ABS(F(1))+.5*10^(-F(2)):F(6)=0:F
(8)=0:IFINT(F(5))=0THEN3700
 3000 IFF(6)>0THENF(5)=F(5)/10
 3100 F(6)=F(6)+1:IFF(6)>F(3)-F(2)-2THEN 4400
 3200IFINT(F(5))>9THEN3000
 3300FORJ9=F(6)TO1STEP-1:IFINT(F(5))=0THENF(5)=F(5)+10
 3400F(8)=F(8)+1:F$(F(4)-J9)=F$(INT(F(5))+25):IFF(8)>6THENF(5)=0
 3500F(5)=10*(F(5)-INT(F(5))):NEXT:IFF(8)>6THEN 4100
 3600F(5)=ABS(F(1))+.5*10^(-F(2))
 3700 FORJ9=1TO F(2):F(7)=F(4)+J9:F(5)=10*(F(5)-INT(F(5))):IFINT(F(5))=0THENF(5)
=F(5)+10
 3800F(8)=F(8)+1:F$(F(7))=F$(INT(F(5))+25):IF F(8)>6THEN 4000
 3900NEXT
 4000IFF(2)>0THENF$(F(4))="."
```

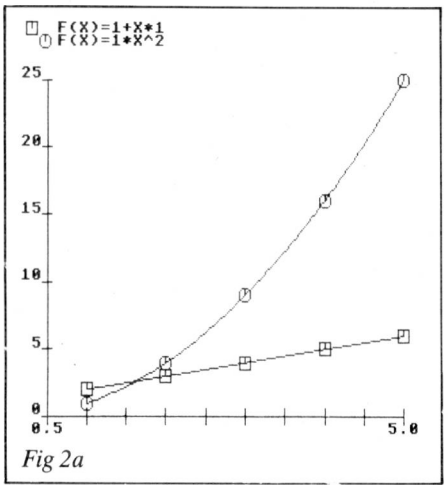


Fig 2a

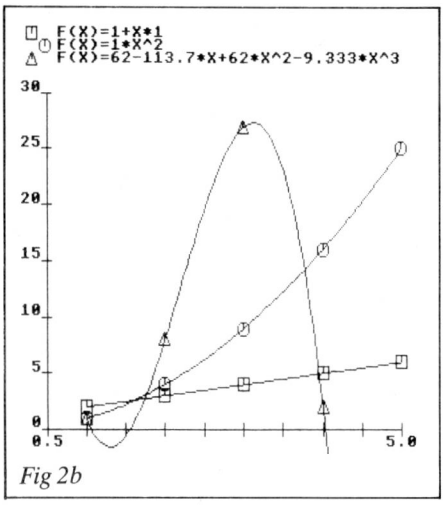


Fig 2b

ings are based on the equation:

$Y = MX + C$

However, in some cases, data should pass through the origin. When this is so, and especially if data is sparse or bad, it is better to use the correct equation which omits the constant. Some users, dimly aware of this, seek to type in a large number of 'dummy' points 0,0. This is bad practice and, as a trial will readily show, distorts the result to give false answers. The facility for the simpler form is thus important.

Polynomial functions

These are among the most powerful of curve-fitting routines — but also the most dangerous, as only a graphical display or a wide-ranging numerical interpolation can show. One of us recently used such functions in handling data for the charging of car batteries. The result was a marvellously close fit. However, graphing the results revealed that the actual function (a third order polynomial) was, in physical terms, a nonsense. So graphic display is really essential here. The other important point is that the readily available program listings (see References) for this type of fit allow the user to select the order of polynomial up to a maximum of around eight, that is anything from:

$Y = MX$

to $Y = M_0 + M_1X + M_2X^2 \ldots M_8X^8$

GOTO page 206

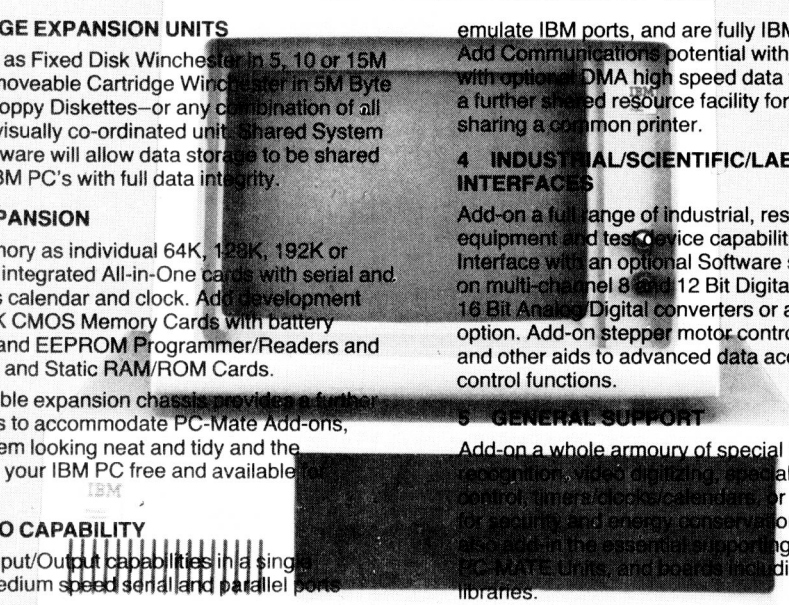
```
 4100IFF(1)<0THENF$(F(4)-F(6)-1)="-"
 4200 F$(F(3)+1)="":F$="":FORJ9=1TOF(3):F$=F$+F$(J9):NEXT:IFABS(VAL(F$))>=1THENF
$=" "+F$:RETURN
 4300 T$=LEFT$(F$,F(4)-1):Z$=RIGHT$(F$,LEN(F$)-F(4)+1):F$=T$+"0"+Z$:RETURN
 4400F$="":FORJ9=1TOF(3):F$=F$+"$":NEXT:RETURN
 4500FORJ=1TON
 4600I=J-1
 4700A=A(J)
 4800IFA>=A(I)THEN5200
 4900A(I+1)=A(I)
 5000I=I-1
 5100IFI>=0THEN4800
 5200A(I+1)=A
 5300NEXT
 5400RETURN
 5500MOVE100,100:DRAW100,1000
 5600MOVE100,100::DRAW1000,100
 5700FORI=100TO1000STEP40
 5800MOVE100,I:DRAW90,I
 5900NEXT
 6000S$="M100,100"+R$+"X1,125,20,20"+R$+"M100,100"+R$+"X0,124,20,20":GOSUB13800
 6100FORI=100TO1000STEP40
 6200MOVEI,100:DRAWI,90
 6300NEXT
 6400RETURN
 6500RETURN
 6600CLS:FORI=0TON:X(I)=INT(SX*(P(0,I)-X0)):NEXT
 6700FORI=0TON:Y(I)=INT(SY*(P(1,I)-Y0)):NEXT
 6800FORI=0TON:MOVE X(I)-9+100,Y(I)+100:DRAW X(I)+100+9,Y(I)+100
 6900I0=X(I):J0=Y(I):GOSUB13500
 7000MOVE X(I)+100,Y(I)+100-9:DRAW X(I)+100,Y(I)+100+9:NEXT:RETURN
 7100PRINTTAB(32,1)"POINTS"
 7200GOTO6500
 7300REM
 7400FORI=0TON:A1(I)=P(1,I):NEXT
 7500FORI=0TON-1:D(I)=P(0,I+1)-P(0,I):NEXT
 7600D(N)=D(N-1):D(N+1)=D(0)
 7700B(0)=2*D(0):FORI=1TON-1:B(I)=2*(D(I)+D(I-1)):NEXT:B(N)=2*D(N-1)
 7800C(0)=3*(A1(1)-A1(0)):FORI=1TON-1:C(I)=(D(I-1)*(A1(I+1)-A1(I)))/D(I)
 7900C(I)=C(I)+((D(I)/D(I-1))*(A1(I)-A1(I-1)))
 8000C(I)=3*C(I):NEXT:C(N)=3*(A1(N)-A1(N-1))
 8100V(0)=B(0):V(1)=B(1)-(D(1)*D(N+1)/V(0))
 8200FORI=2TON:V(I)=B(I)-((D(I)*D(I-2))/V(I-1)):NEXT
 8400W(0)=C(0):FORI=1TON:W(I)=C(I)-(D(I)*W(I-1)/V(I-1)):NEXT
 8500B(N)=W(N)/V(N):FORI=N-1TO1STEP-1:B(I)=(W(I)-(D(I-1)*B(I+1)))/V(I):NEXT
 8600B(0)=(W(0)-(D(N+1)*B(1)))/V(0)
 8700C(0)=0:C(N)=0:FORI=1TON-1:C(I)=(A1(I+1)-A1(I))/(D(I)^2):C(I)=3*C(I):C(I)=C(
I)-(((2*B(I))+B(I+1))/D(I)):NEXT
 8800FORI=0TON-1:D(I)=(C(I+1)-C(I))/(3*D(I)):NEXT:RETURN
 8900PLOT69,X(0)+100,Y(0)+100:I0=X(0):J0=Y(0):GOSUB13400:FORI=0TON-1:FORJ=X(I)TO
X(I+1)STEP3:TEMP=X0+(J-5)/SX
 9000TEMP=TEMP-P(0,I)
 9100TEMP=A1(I)+B(I)*TEMP+C(I)*TEMP^2+D(I)*TEMP^3
 9200TEMP=SY*(TEMP-Y0)+.5
 9300DRAW J+100,TEMP+100:I0=J:J0=TEMP:GOSUB13600
 9400NEXT:NEXT:RETURN
 9500GOSUB 12800:GOSUB 1000:GOSUB 10600:S1Y=900:GOSUB 10400
 9600GOSUB14000:GOSUB 6600:GOSUB 5500:GOSUB 7100
 9700 GOSUB 7300:GOSUB 8900:GOSUB 12900:GOSUB12800:MODE 7
 9800INPUT"NAME OF X-AXIS "X$
 9900INPUT"NAME OF Y-AXIS "Y$
10000S$="S9"+R$+"M1000,0"+R$+"P"+X$:GOSUB13800
10100S$="M120,2400"+R$+"P"+Y$:GOSUB13800
10200S$="H":GOSUB13800
10300END
10400FORI=0TON:A(I)=P(0,I):NEXT:GOSUB4500:SX=900/ABS(A(N)-A(0)):X0=A(0)
10500FORI=0TON:A(I)=P(1,I):NEXT:GOSUB4500:SY=900/ABS(A(N)-A(0)):Y0=A(0):RETURN
10600REM
10700PRINTTAB(5,4)"You now have to enter your data":PRINTTAB(5);"You first enter
 the X-VALUES"
10800PRINTTAB(9);"and then the Y-VALUES"'''':PRINTTAB(11);"To finish type '/'":N
=0
10900DRAW1279,0:DRAW1279,1023:DRAW0,1023:DRAW0,0
11000VDU19,0,4,0,0,0
11100GOSUB12900
11200 CLS:PRINTTAB(0,5);"What is x-value of point";N+1:PRINT"Press <RETURN> afte
r typing your numbers":INPUT N$:IF ASC(N$)=47 THEN 11700
11300 IF ASC(N$)<48 OR ASC(N$)>57 THEN 11200
11400P(0,N)=VAL(N$)
11500PRINT'"What is y-value":INPUT N$:IF ASC(N$)<44 OR ASC(N$)>57 OR ASC(N$)=46
OR ASC(N$)=47 THEN 11500
11600 P(1,N)=VAL(N$):N=N+1:GOTO11200
11700N=N-1:F(3)=7:F(2)=2:FORJ=0TO(1+.4343*LN(N))
11800    CLS:PRINTTAB(7,4);"READING   X-VALUE   Y-VALUE"'':FORI=0 TO9:IFI+10*J>
N THEN 12000
11900PRINT1+I+10*J;:F(1)=P(0,I+10*J):GOSUB 2800:PRINT SPC(6-LEN(STR$(1+I+10*J)))
;F$;:F(1)=P(1,I+10*J):GOSUB 2800:PRINT SPC(2);F$:NEXT
12000PRINT'"Is data OK?":T$=GET$:IF ASC(T$)<>89 AND ASC(T$)<>78 THEN 12000
12100IF ASC(T$)=89 AND I+10*J>N THEN 12600
12200IF ASC(T$)=78 THEN 12300
12300PRINT"Enter number of wrong set":INPUT X:CLS:PRINT'"Enter x-value of point"
X:INPUTP(0,X-1)
12400PRINT"& now the y-value":INPUTP(1,X-1):GOTO12000
12500NEXT
12600 CLS
12700 PRINTTAB(5,8);"Calculations being made":RETURN
12800 FORI=26TO35:READ F$(I):NEXT:RESTORE:RETURN
12900PRINTTAB(4,26)"Press the SPACE BAR to continue"
13000VDU23;8202;0;0;0;
13100SOUND1,-13,100,8
13101SOUND2,-13,105,8
13200A$=GET$
13300RETURN
13400I0=I0*2.4+100:J0=J0*2.4+100:S$="M"+STR$(INT(I0))+","+STR$(INT(J0)):GOTO1370
0
13500I0=I0*2.4+100:J0=J0*2.4+100:S$="M"+STR$(INT(I0))+","+STR$(INT(J0))+R$+"N2":
GOTO13700
13600I0=I0*2.4+100:J0=J0*2.4+100:S$="D"+STR$(INT(I0))+","+STR$(INT(J0))
13700IFI0<0ORI0>2500ORJ0<0ORJ0>2500THENRETURN
13800IFplot=FALSE THEN RETURN
13900FORL0=1TOLEN(S$):VDU1,ASC(MID$(S$,L0,1)):NEXT:VDU1,13:RETURN
14000PRINT"PLOTTER ON";:INPUTS$:IFLEFT$(S$,1)="Y"THENplot=TRUE ELSE plot=FALSE
14100RETURN
```

ADD-ONS, ADD-INS AD INFINITUM

Tecmar's PC-Mate Add-ons will transform your IBM Personal Computer. They add breadth to its possible applications and depth to its capabilities. You can choose from over 60 PC-Mate Add-ons - all fully compatible with your IBM PC. You can improve your standard facilities, or add new specialised functions. You can share data storage and output resources between several PC's, or eliminate the need to purchase new PC's for more occasional and less demanding requirements.

Tecmar Add-ons are already proven in thousands of applications world wide, and are now available in this country from Comart–Tecmar's Sole UK Distributor.

Just look at the possibilities for expansions and enhancement–then send for further information, or talk to your local PC-Mate dealer. The possibilities are infinite.



1 DATA STORAGE EXPANSION UNITS

Add Data Storage as Fixed Disk Winchester in 5, 10 or 15M Byte Units, or Removeable Cartridge Winchester in 5M Byte Units, or twin 8" Floppy Diskettes–or any combination of all three in one neat visually co-ordinated unit. Shared System Adaptors and Software will allow data storage to be shared between up to 4 IBM PC's with full data integrity.

2 MEMORY EXPANSION

Add dynamic memory as individual 64K, 128K, 192K or 256K cards, or as integrated All-in-One cards with serial and parallel ports, plus calendar and clock. Add development capability with 32K CMOS Memory Cards with battery backup, EPROM and EEPROM Programmer/Readers and Expansion Cards, and Static RAM/ROM Cards.

A visually compatible expansion chassis provides a further 11 expansion slots to accommodate PC-Mate Add-ons, keeping your system looking neat and tidy and the expansion slots in your IBM PC free and available for future needs.

3 EXTENDED I/O CAPABILITY

Add-on multiple Input/Output capabilities in a single expansion slot; medium speed serial and parallel ports emulate IBM ports, and are fully IBM software compatible. Add Communications potential with multiple RS232 ports with optional DMA high speed data transfer capabilities. Add a further shared resource facility for up to four IBM PC's sharing a common printer.

4 INDUSTRIAL/SCIENTIFIC/LABORATORY INTERFACES

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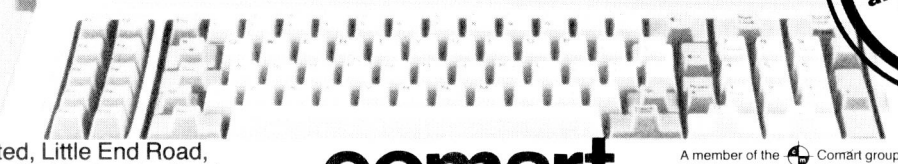

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COMPUTER ANSWERS

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

Bibliophile

During a research project I have accumulated a large file of bibliographic references. At present this is on index cards, but I would like to transfer it to my (CP/M) micro system. I need to be able to view and index my file in order to prepare a selective bibliography, and cost is a problem. Help!
N Weaver, Worcester

Although dBASE II can be turned to most tasks and has good searching and sorting, it is ruled out here by the £400 price tag. Caxton's Cardbox is very good at holding card-image records, automatic indexing, selective extraction of records from the file and printing records to a chosen format, and costs a third as much. Its weakness is that the file of selected records is in the same order as the parent file: no sort facility, annoying if you want author order and your master file isn't so arranged. Now Gem Cardsort adds the sort feature; you can take a Cardbox file, Cardsort it and return the result to Cardbox for formatted printing. Cardsort from Gem Systems, 2 Crawford Rd, Hatfield, Herts, tel 66148, is available in Osborne, Sirius and most common disk formats at £49.95 (good discount if purchased with Cardbox).
Len Warner

Syntax errors

I would like to know if there is a book or cassette which tells you how to sort out syntax errors as I am a complete novice Oric-1 owner, and after putting what seems like hours of typing into the computer (copied from the manual and from *PCW* 'Oric Bug Eater') all I get are repeated syntax errors, and needless to say it's rather annoying.
Ian Briggs, Huddersfield

You have been unlucky with an unfriendly micro and a bug-ridden program. Ian Sinclair's book on the Oric, published by Granada at £5.95, will give you a different approach. You could also take your Oric manual to the bookshop and select a programming book which you think you might be able to understand and which uses a Basic as much like Oric Basic as possible. Another clue is in your one-sentence question. Don't type for hours. Pick small examples. Get them right quickly. Understand them. Then understand larger programs as combinations of smaller ones.
Len Warner

Untimely death

I have been trying to transfer a document from a word processor to an Osborne 1 via the serial RS232 interface. I am using a 'PIP filename. ext=RDR:' command which works on another micro, but the Osborne just dies until it is reset or control-Z is typed. I have been able to send a file to the word processor using PIP.
Z Merali, Hatfield

A 'dead' micro is often a symptom of a wrongly wired cable, but your problem is clearly the IOBYTE. This is a useful CP/M feature which is not implemented on all micros. It allows you to switch each of the four logical I/O devices — console, reader, punch and list — independently between four physical devices, without having to modify your programs. The default Osborne IOBYTE value assigns list to the printer port and the others to the keyboard or screen, which is why control-Z end of file key woke it up. You change the assigment using the STAT command (manual p244). I suggest RDR:=PTR: for serial input and PUN:=PTP: for serial output, then you can keep LST: free in case you use a Centronics printer.
Len Warner

Disk decision

I use a 'mainframe' in my job and I am new to the world of microcomputers. I plan to buy a BBC Model B and use it for word processing, games, business and programming. Please tell me:
What are the advantages of a disk drive compared with tape?
What, if any, advantages do twin disk drives have over single drives?
Can cassette programs be loaded via the computer onto disk?
G C Vincent, Stoke on Trent

A disk may hold many files, and they are all equally accessible. Several may be opened at one time, or in quick succession, without manual intervention. A tape allows only one file open at a time — only the last one on the tape for output — and it often needs rewinding or changing. The data transfer rate is also very much slower. As a result, using a disk-based system is very much more convenient, since you have a library of programs and datafiles literally at your fingertips, instead of needing cassette changes. For example, loading Micronet software takes about three seconds instead of three minutes, and it is immediately ready to capture and save Prestel frames to disk. Also, file operations like sorting or master file update become practical, whereas they could only be done with several computer-controlled tape drives. Finally, it is possible to set up random-access files for a records management or database system, which could not be supported by a tape system at all.

Twin disks have two advantages over single. One is that you can share out files between disks for best efficiency. During data entry this means keeping programs on one drive and data files on the other for best use of space. While sorting you use both drives for data to minimise head movements.

For copying, use one drive as source and the other as destination to avoid disk swapping. The other advantage is hardware backup; since most tasks can be done with one drive, though less efficiently; with two disks you can continue working when one breaks down.

Tape programs are usually written to use low memory addresses which are needed by the disk operating system, so a simple conversion job is necessary. First you *LOAD the tape to a higher address than normal, then save it as a disk file. To run it, first load, then move it to its correct address. When it has finished, reselect the DOS ROM to get back to disk.
Mike Forster

Speak up

Can you tell me whether there is a computer with a speaking voice which can read out printed material, texts, and so on? I have been unable to find any computer outlets which know of one.
V S, Tottenham

For several tens of thousands, you can buy a Kurzweil Direct Entry Machine, which you might use to read your library into an electronic text retrieval system — it talks too! Dispense with the document reader and type the text into the computer

New TRS-80™ Model 4



16K Cassette-Based Model 4 **£749** Inc. VAT
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64K 2-Disk Model 4 **£1499** Inc. VAT
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TRS-80 Model 4 Personal Desktop Computer. Yes, it *looks* similar to a Model III, but compare the price and the standard features of this all-new Model 4 to any other computer in its class.

Amazing Versatility. Model 4 can run all Tandy® Model III programs without change. It will soon be able to run CP/M-based software. This means that Model III disk owners can upgrade to a Model 4 without making their present software obsolete, and have at their disposal thousands of different applications.

Friendlier ... and Faster. Because of its 64K memory and 80 x 24 display, you'll find Model 4 perfect for large business applications. Clock speed is twice that of Model III, plus there's "MemDisk", which lets you use extra memory as a superfast disk drive. The result is keystroke-quick responses instead of time-consuming disk access.

And That's Not All. The software print spooler lets you print out a job at the same time you're using Model 4 for other tasks. With the Job Control Language, you can set up a whole series of operations for your Model 4 to perform without supervision. The new Microsoft BASIC includes CHAIN and COMMON for extra-large programs.

Full - and Helpful - Documentation. You get a comprehensive owner's manual, reference card, our famous tutorial manual for BASIC programming and a tutorial manual for BASIC programming and a tutorial introduction explaining how to get the most out of your Model 4.

Super Features. Including a full 80-column by 24-line display for word processing and large spreadsheets, a built-in high resolution green screen monitor, numeric keypad, parallel interface and dual 5¼" disk drives, a new keyboard with control, caps. and three function keys, and compatability with Model III TRSDOS, LDOS and CP/M plus programs that puts thousands of applications at your disposal.

Model 4 Upgrades

64K RAM Kit For Disk Model 4. Expands internal memory from 64K to 128K. Installation required (not included).
26-1122 ..... **£99.95**

RS232C Interface Board. Installation required, (not included).
26-1148 ..... **£79.95**

Microprocessor: Advanced Z-80A 8-bit. **Clock Speed:** 4 MHz. **Memory:** 14K ROM, 64K RAM-expandable to 128K **Keyboard:** 70-key typewriter style with control key, 3 programmable function keys (F1, F2, F3), caps key and 12-key datapad. **Video Display:** 80 characters by 24 lines (Model 4 mode), 64 x 16 (Model III mode), or double-wide 40 or 32 characters per line. Upper and lower case and reverse video. Memory mapped with high-resolution 12" green monitor, includes 96 text, 64 graphics and 96 "special" characters. **Sound:** Obtainable from BASIC with sound command including tone and duration. Toggled "keyclick" filter. **Disk Drives:** One or two built-in double density 184K 5¼" drives. **Operating System Compatability:** TRSDOS 6.0, TRSDOS 1.3, LDOS, CP/M Plus (available soon). **Programming Language:** New Advanced Microsoft BASIC with CHAIN, COMMON and more. **Input/Output Interfaces:** Cassette operation at 500/1500 baud selectable under ROM BASIC. Parallel printer interface with TRSDOS print spooler. Model III/4 Input/Output bus. **Dimensions:** 12½ x 18⅞ x 21½". **Power:** Integrated power supply, 240v AC, 50 Hz.

Model III Owners!

Model 4 Upgrade Kit. Allows Model III disk system owners to convert their computer to a Model 4. Installation required, (not included).
26-1123 ..... **£599.95**

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PCW-7

yourself. Then you can use the Votrax Type-'N-Talk, or the $250 Microvox kit text-to-speech synthesiser described in detail by Ciarcia in *Byte* magazine (Sept & Oct 1982). These connect like a printer and use a rule-based program to translate the text into phoneme codes, which are then spoken by a Votrax SC-01A chip. The same Naval Research Laboratory algorithm is used in the speech synthesiser by Braid Systems Ltd, 175-179 St John St, London EC1V 4LS, tel 01-253 0966. This costs £499. It has more buffer than the US units and also allows new software to be downloaded, so that facilities can be expanded.
Len Warner

Brainy questions

Could you please answer the following questions about the Grundy NewBrain?
How much memory is left for Basic programs when using 80 characters per line and 640 × 250 graphics resolution?
What kind of picture would I get when using a Teleton 14 in colour television under the above conditions?
Could you compare the NewBrain and the BBC computer in graphics capabilities and expansion?
D Scott, Glenrothes
Unlike most machines which have a fixed memory map for the display, the NewBrain allows you to choose width and height when you open a graphics screen. This means that there is not a specific chunk of memory 'taken over' for the graphics. However, you still need one bit per pixel (dot), so a full screen will take nearly 20k from your 32k RAM, leaving 12k to be shared by Basic and the operating system. If you open several screens or other I/O streams, things will get pretty crowded.

When a colour TV is used for high-res graphics, both the TV electronics and the tube shadow-mask limit dot resolution. You can only find out if it is unacceptable by trying. A monochrome monitor would be better for this.

The NewBrain graphics capabilities are based on a different concept from the BBC micro, having 'Turtle' turn and draw commands, and lacking colour. This makes them more suitable for 'pen and ink' drawings than the 'coloured paintbrush' draw and fill on the BBC.

Both machines have potential for expansion, and we eagerly await disks from Grundy and Tube coprocessors from Acorn.
P L McIlmoyle

Hide and seek

WordStar generally fits OK into the Osborne's 52 column screen, but when using 'Find and Replace', the cursor flashes back and forth between the string you want to find and the 'replace?' question.

Owing to this question being outside the 52 columns, the screen almost always scrolls so that you cannot see the find string, and you have to scroll manually — very time-consuming in a long document. Is there a way of fixing this so that you can always see the find string?
Quentin Deane, Bury St Edmunds
The Osborne screen is a 52 column window into a 128 column display memory area. To make the best use of the display, the window is dragged along by the cursor as it reaches the edge of the screen. That works quite well except in your case. To stop it, you need only use the SETUP program to set 'auto horizontal scroll' OFF (p42 in the manual). Then the left 52 columns will stay in the window unless you use the arrow keys to scroll manually. Since this patches CP/M on disk, it isn't something that you can switch on and off without rebooting, unless you use the ASM assembler to make a program which toggles the flag byte at E168H between 0 (off) and FFH (on).
Len Warner

Colouring book

Can you recommend a book on TRS-80 Color graphics?
John Gold, Brighton
My local bookshop has three titles: *TRS-80 Color Basic*, by Bob Albrecht, Wiley, £7-50; *TRS-80 Color Computer Graphics*, by Don Inman, Prentice-Hall, £12-70; and *Programs and Applications for the Color Computer*, by Alfred Baker, Prentice-Hall, £12-70. Despite the title, Albrecht puts lots of emphasis on handling the display through his choice of examples, so at the price this seems best value. Inman is slightly more technical and firmly graphics-centered. Baker has more varied and interesting applications.
Len Warner

Second-hand news

Although your 'beginners-start-here' column still refers to stringy-floppies, I have not been able to find one except in the second-hand column. None of the firms who used to supply them know anything about them. Was there anything technically wrong with them that caused them to disappear? I could make use of one on my TRS-80.
W Gray, Farnborough, Hants
When disk drives were expensive and novel, the Exatron wafer tape provided a cheaper compromise. Now disks are commonplace, their obvious advantages and the pull of the disk software market has crowded it out. There is nothing technically sour about tape loop cassettes; indeed, the very simple mechanism makes them quite reliable. The idea is just having a rebirth, since both Sinclair and Texas are bringing out low cost tape loop filing systems.
Len Warner

Warner's corner

This is a spot for me to request some information from you, and also to comment on the odds and ends that don't quite make the grade as answers and the feedback you often give us. I'm not going to compete with TJ, there isn't the space, so any longer pieces will get passed on. Here we go . . .
Wanted: A Sharp MZ expert able to do answers on interfacing and software for this rather neglected machine.
Epson printer users: Did you know the ribbon cartridges were refillable? With the MX100 cartridge around £13.50 and a ribbon pack about £4, it is well worth doing. But they are difficult to find, so don't write in unless you are a *supplier*, and I'll make up a list. Meanwhile, watch this space and don't throw those used ribbons away . . .
TRSDOS: J W Bailey informs me that PDRIVE 0,1,DDGA=6,A before formatting a disk on drive 1 will set the maximum directory space, allowing T R Martin (June) up to 222 files.

END



'We returned to the terraces to get away from the violence of home computer games. . .'

LISAWRITE

Intrepid reporters Robin Webster and Leslie Miner follow up last month's Apple Lisa scoop with an analysis of the word processing program, Lisawrite.

In last month's *PCW* we gave an overview of what the Lisa Office System could do — however, time did not permit an in-depth look at any of the Software Tools. One program that was certainly given only the briefest attention was the word processing tool, LisaWrite.

As a standalone system, LisaWrite offers as wide a range of facilities that a non-specialist would require but, of course, it has the 'what you see is what you get' characteristic along with the ability to accept input from other documents created on a Lisa system (although not all, as we shall see). It is a screen-based editor, but, because of its mouse cursor control, is unlike any you've used before.

Starting up

To enter LisaWrite, you must first activate, or 'tear-off' a piece of LisaWrite paper from the relevant pad. This pad is available from the ProFile storage disk which is represented as an icon, or object, on the Lisa Desktop.

To open up the ProFile's window, that is, to represent its contents graphically, you must place the mouse-controlled cursor (represented by a small arrow at this point) on the ProFile icon and click the mouse button twice. Once the window is open, it is then possible to locate the LisaWrite paper pad and begin work.

Repeating the icon selection procedure on the LisaWrite pad, ie, pointing to an icon with the cursor and pressing the mouse button twice . . . produces another icon, with the name 'Untitled' next to the pad. At this point you can give this blank document icon a name by simply placing the cursor over the word 'Untitled' and starting to type whatever file name you wish; I called it LisaWrite Review.

Clicking twice with the mouse on the LisaWrite Review icon opens up an empty window on the screen. The cursor is changed from an arrow to what is called an 'I' beam cursor which is easily positioned between characters. At this point you are 'in' LisaWrite and can therefore start typing whatever you wish, but let's first take a look at the commands that are available to us.

The text cursor, which is a very thin flashing vertical line, can be placed rapidly anywhere on the screen by means of the mouse controlled I-beam cursor, so you don't have to sit with your finger on a cursor control key, scrolling the screen. This is of great value when there is a mistake somewhere in the text situated in the middle of the screen.

Across the top of the screen, outside the window border, there is the ever-present menu bar. The range of features available through this menu bar differs depending on the Lisa Software Tool being used.

LisaWrite's main menu bar is: File/Print (which is quite self explanatory); Edit (which offers such functions as Cut, Copy and Paste to move text around); Search (this offers search and replace capabilities, global and otherwise); Type Style (there are eleven standard typestyles and a range of special variations — see Fig 1); Format (margins, tab stops, text justification and inter-character spacings are the features offered here); Page Layout (which allows the user to check how the page will look when it is printed and where such things as footers and headers will appear).

To select any one of these options, you simply place the cursor over the relevant word, press the mouse button, and keep it depressed. This causes further menu selections to appear in the form of a pulldown menu. As the cursor is moved down over these menu commands they become momentarily backlit (reverse video). Stopping the cursor over a command and releasing the mouse button is all you need to do to activate any command.

So, if we want to set up margins and tab stops we would go to the Format menu option and then select 'Show Margin/Tab Ruler' from the pull-down menu; see Fig 2. By activating that command we get a display like that in Fig 3.

As you can see, some text, with one or two errors, has already been input, but I've decided to make some changes to the margin and tab stop settings. Also notice that another option, called 'Ruler', has appeared on the menu bar. This offers the ability to alter the ruler markings from inches to centimetres.

Left and right margins are adjusted by selecting the little triangles marked 'L' and

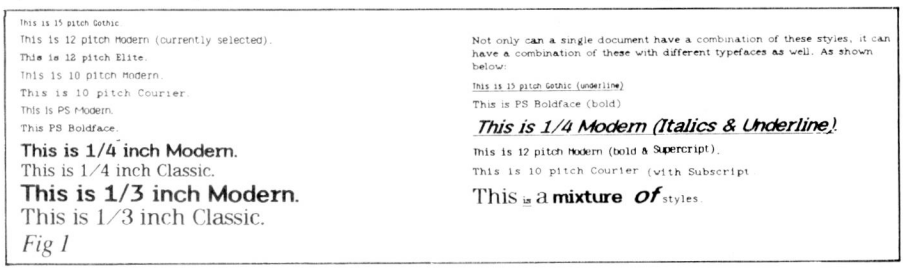

Fig 1

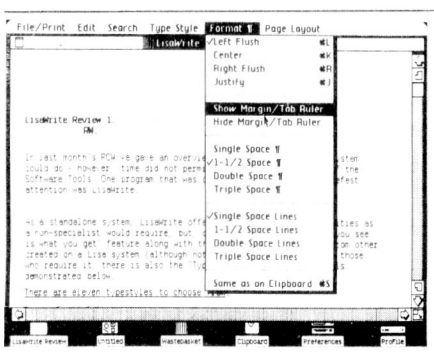

Fig 2

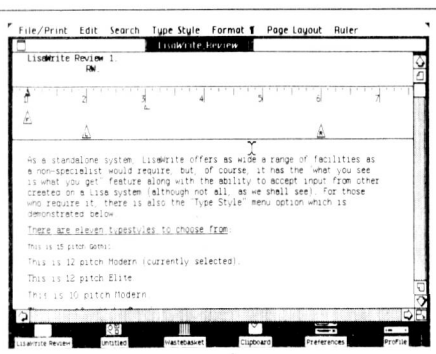

Fig 3

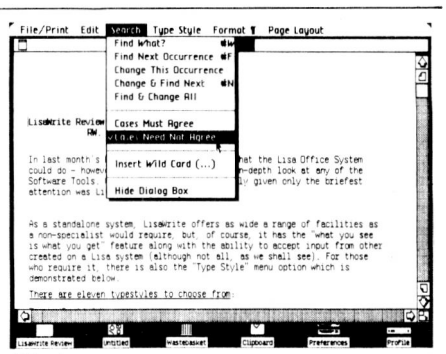

Fig 4

'R' with the cursor, and moving them around until they are satisfactorily positioned. Tabs are set by picking up the triangle marked 'F', and putting it down at whatever tab interval you wish. The screen in Fig 3 shows one tab set at the three-inch point.

Once everything is as you wish, the margin/tab ruler can be removed by selecting 'Hide Margin/Tab Ruler' from the Format menu bar option. Any text that is entered after such an operation will be arranged according to the new settings.

LisaWrite is more concerned with treating text as a total object, and not as a group of sequential pages (unlike the word processing system that is available, say, on the Wang Personal Computer, or those editors that are designed for dedicated word processing systems). Essentially, this means that you cannot simply press a 'goto page x' button to move around in a document. Instead, LisaWrite offers a set of text movement controls which are an integral part of the document window's border.

At the top right of the window border there is, in descending order, an upward pointing arrow, what looks like a dog-eared piece of paper, and a small white square.

The arrows (there are four to each window) provide the same capability as the up/down/left/right cursor controls on ordinary computer keyboards; they scroll the document one line at a time in one of four directions.

The dog-eared paper symbols (there are two) are used for whole-screen jumps, since they are supposed to indicate the turning of a page.

For very big text jumps, say, from the beginning to two-thirds into a document, the small white square, called an elevator, is used. The elevator can be moved up and down the whole height of the window, and whenever it is moved, the text in the window moves in conjunction. LisaWrite only has a vertical elevator, while other Software Tools have both vertical and horizontal elevators.

The symbol placed at the bottom-right of the window indicates the point at which the user can 'pull' on the window border to make the window bigger or smaller (you tug down and to the right to make it bigger, and up and to the left to make it smaller).

Suppose that we already have input some text and now wish to edit it by maybe deleting a few words, moving some others around, and changing a typestyle or two. The main thing is to tell the system which sections of text you are interested in altering. You do this by running the I-beam cursor over the relevant text with the mouse button depressed. This has the effect of backlighting the text, and readies it for editing operations.

If you want to delete a piece of text you go up to the Edit menu option, enter the pulldown menu, and select Cut. The highlighted text will disappear (it has actually been placed on the Lisa clipboard icon at the bottom of the screen, however). If you want to move a block of selected text to a new location you would first Cut and then select the Paste option (to bring it back from the clipboard). If you want to change a section of highlighted text and make it appear bold, you would go to the Type Style menu option and make a typestyle choice.

Since you are able to select discrete sections of text with LisaWrite, in common with many other word processing systems on the market, it is possible to also use the margin/tab ruler to make certain paragraphs or lines appear narrower or wider than the overall body of text.

In Fig 4 you can see the range of Search facilities offered by LisaWrite. There is 'Find What?' which, when selected, displays a dialogue box in which the user types the word that must be found and, if appropriate, the replacement word.

'Find Next Occurrence', 'Change This Occurrence', 'Change & Find Next', and 'Find & Change All' are the supporting commands, since they offer a set of convenient document search techniques that are at one time or another used by word processing operators.

As far as being integrated, LisaWrite is a bit of a disappointment because at the time of writing it can only interact with the LisaCalc system. According to Apple, the problem has to do with the data formats involved in textual and graphics storage, but the company says that it is trying to resolve the situation. So for now, you can create a spreadsheet and paste part(s) of it directly into a LisaWrite document, but you can't do much else. If you really need to create a high-quality document with both graphics and text you can produce quite good results by staying entirely within LisaDraw. An example of LisaDraw text and graphics is shown in Fig 5. Once you get used to it, you can easily produce documents that look as if they had been done mainly within LisaWrite, but with a little help from LisaDraw.

Finally, having written and corrected your document, you must get ready to print it out.

All the printouts created for last month's overall review, and this program-specific review, were produced on an Apple dot matrix printer either by dumping screen contents straight to the printer or printing from main memory. Screen dumps automatically result in low-resolution output (Figs 2 and 3 are examples), while memory output can be reproduced in both low and high-resolution (Fig 5 is a high-resolution example).

While the LisaWrite system is not primarily page-oriented, it does allow the user to see how pages will be printed out before any printing has taken place. By going up to the Page Layout menu option, you can select 'Preview Pages' from the resultant pulldown menu. This organises the document into as many pages as are required. If you need to check the layout in more detail, you can preview pages and display what is called the 'Page Ruler' down the right-hand side of the document window (see Fig 6). This ruler is very similar to the margin/tab ruler, but is used to show how document text lies in the page printing area, and where headers and footers are supposed to be.

Once everything is ready to print, you go to the File/Print menu option and obtain the display shown in Fig 7 by selecting 'Format For Printer'. This, like almost everything about the Lisa system, is very easy to follow. Printouts can be done either in the normal letter-style fashion or in landscape mode.

Conclusions

LisaWrite is a very reliable word processing system that has much to commend it. There were times, though, when I felt the system was too slow. The slowness was especially noticeable during scrolling operations or when quite a large amount of data was being block-moved (I suppose it is in the nature of a bit-mapped display). Occasionally, I also encountered delay when trying to select a small amount of text, such as a two-letter word, or maybe even single punctuation mark. The black on white display was very easy to use for long periods, and there was no perceptible flicker on the screen.

In general, being able to pinpoint rapidly text with the mouse-controlled cursor was a major feature of the system, and one that makes up/down/left/right cursor movements seem ever more tedious. LisaWrite won't replace any dedicated word processing systems, but it might well encourage a lot more business people to get involved in the creation of well put-together documents. **END**

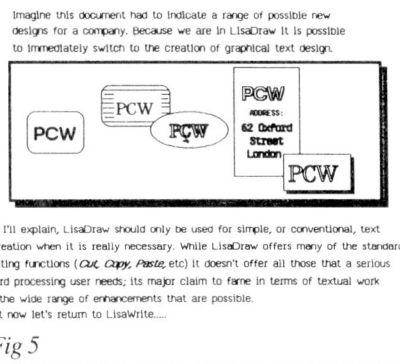

Fig 5

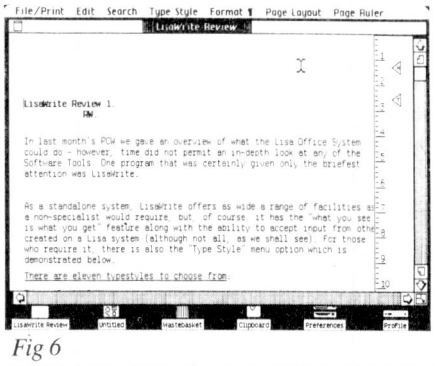

Fig 6

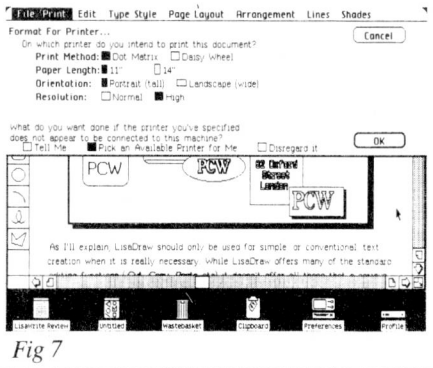

Fig 7

DATAPLAN
GAMES PACKAGE DISGUISED?

A cassette-based database package for the Dragon computer has been described by its author as a 'training aid' for a 'real' database package. Tony Harrington investigates its usefulness.

Buying a database package on a standard business-oriented microcomputer is one thing. Getting a cassette-based database package for a home computer is another thing altogether.

Dataplan by Personal Software Services costs £12.95 instead of the hundreds of pounds that systems like Tomorrow's Office, The Silicon Office or even DBase II will set you back. That sounds like a bargain, but does Dataplan offer the enthusiast any more than the illusion of handling data? Is it really a games package in disguise?

As the brief snippet of paper that passes for an instruction booklet in the cassette-based package says: 'Dataplan is a data-base-type filing system which allows users to access, sort and print information as required.'

First impressions

The cassette takes less than a minute to load and the first thing that happens, once 'RUN' has been typed in, is that a message is displayed on the screen to tell you that the program is setting up 'EOF Markers'. That is not a message that makes a lot of sense to a naive user, who probably wouldn't know what an end-of-file marker was even if he or she decoded the acronym.

This routine takes a few minutes to complete, and the keyboard — fortunately — is locked while this goes on. Then the screen message switches and you are told to 'Press N for new file or L to load an already saved file from cassette'. All messages are in black capitals on a green background.

Pressing N brings a request for a file name, which can be up to 12 characters. Once this is filled in and 'entered', the main menu comes onto the screen. This is:

0: QUIT
1: AUTO SORT FILE
2: SET COLUMN TITLES
3: SET COLUMN TAB STOPS
4: SET PRINTER MODE
5: ENTER DATA
6: DISPLAY FILE
7: GET OR EDIT RECORD
8: RECORD FILE TO CASSETTE
9: LINE PRINT FILE

The tiny instructions sheet deals with seven of the above nine options. I was struck by the discrepancies between the terminology on the scrappy little sheet in front of me and that of the menu. Option one, for example, on the instruction sheet talks about 'Auto file set'.

I assumed that they were one and the same thing. Auto file set is an opaque little routine which does nothing the user can see except briefly flash up a yellow screen with the legend 'automatic file sort set' (which clarified, in a way, the word shift between the menu and the instructions). The booklet explains that this option has to be run before starting to enter data if you want your records organised in alphabetical order.

Option two, 'Set column titles', involved the user more directly. This is the equivalent on a proper database package of setting field names within a record. Selecting this option brings a request to input the number of records on a file.

To experienced database users, this kind of request presents no real problem. There is a small technical hitch to overcome, of course, since there is no mention anywhere of how many records the Dragon can accommodate. The screen display leaves room for as many zeros as you want to input. The beginner might be excused for thinking that his little computer could handle as many records as he wished to set up.

Gordon Cornell, who wrote Datplan for PSS, says that the latest version of the program is repeated twice on the cassette. The first sets aside 18,000 bits for a maximum file size of 100 records: the second sets aside 13,000 bits for a maximum of 200 records. (That sounds the wrong way round, but he checked the listings!) If you want to set up 200 records, the number of fields you can allocate to each record comes down from ten (the maximum allowed) to something much less. Gordon was not quite sure how much less.

To an inexperienced user, the request to specify the number of records per file can be confusing, since it is not immediately obvious to most beginners what the difference is between a file and a record. The program would benefit from a separate instruction screen explaining some of the knowledge that it assumes of the user.

As an experiment I told the program that I wanted to store 1,000,000 records. It accepted this without a qualm and moved on to the next message screen: 'Input identity column width.'

The identity column is the key on which the package sorts. (It is also the only key.) The instruction sheet explains the term 'identifier' as 'the column which the program uses to find the record'. There was even an example: 'If you want the identifier to be a name, you should allow a column width of approximately 12 — few people have names of more than 12 characters.'

What the instruction sheet did not say was that the wider you set the identification column, the less space you allow yourself for inputting data to other fields in the record. Each field (up to a maximum of ten) occupies one line of a ten line by 23 character display.

The name give to each of the fields is displayed — once the record has been created and is ready to accept data — on the left hand side of the display screen and a space is left on the right hand side for data.

For example:
NAME — JOHNSON, MICHAEL
STREET — 13 BEDFORD SQUARE
AREA — BEVENDEAN
TOWN — BRIGHTON
TELEPHONE NUMBER — 0273 222 222

This produces a rather untidy display.

Irksome points

What annoyed me particularly when trying out this program was that although the 'manual' (to call it that) told me that I could have a maximum of ten fields (which it called column headings), once the tenth title had been input, the cursor moved down one line to make room for an eleventh heading. This takes it out of the green 'box' on the screen and into the black surround. It looks wrong, but there is no way to correct the fault and get back into the box.

Any heading input at this stage shows on the screen until you press enter, when the entire program crashes with the screen message: illegal function call at line xxx.

This has a number of implications. Since there isn't a way of editing column/field headings once they have been entered, any mistakes mean that you have to re-run the program from the beginning — including waiting for the end-of-file markers to be set.

It also means that the user can have a great deal of difficulty working out how to get out of option two and back to the main menu. There is a screen instruction which tells you to enter '@' in order to escape. But what it doesn't tell you is that if you are keying in ten field names, you have to press '@' *before* you press 'enter' to key in the last field name. Otherwise you will end up once again with the cursor below the green box. And the result, once again, will be a program crash, even though you have pressed '@'.

I also managed to get the symbol '@' mixed up with my field name when trying to escape back to the main menu, which I found irritating.

Another problem with the design of the package is that when entering data with option five, if you type beyond a particular column line, the cursor simply moves down a line to the extreme left margin and begins overwriting the next column title. This makes for a very muddled set up.

When using option six, 'display file', the screen display is divided into two by a horizontal line. The left hand side displays the identifier column with up to ten records. The right hand side displays whatever column you have requested. So in a 'names and addresses' type file, you can choose to have names displayed with telephone numbers, or with any other column title you have set up. (The screen displays a request for a particular column number, so you need to have either a printout or to have taken notes to specify which column you want. You cannot just type in the column title.)

Nevertheless, this is a fairly powerful facility, and with the limited number of entries I keyed in as test data, there was no waiting time as it worked almost instantaneously.

One point to note here is that, if you have typed in more than one line of data opposite a particular column, only the first line of that date is displayed in this mode.

You can also call up the whole of any one record for editing, viewing or printing, using option seven. Here, two letters of the 'identifier' were enough to select the record 'Pym, Francis' from the record 'Peters, John'. All the editing is done by selecting a column line number (on the same basis as option six), moving the cursor about and simply overtyping anything that you want to change. This section of the package is simple and easy to operate.

The delete function could cause a few accidents as unlike proper database packages, there is no polite second chance — no message asking you if you are sure you want to delete that record (it only works for whole records).

Conclusions

The package has been designed to work with the Epson MX 80, and you can either print out a whole file or print a particular record. There is no facility for selecting a group of records and printing just the selected group.

In addition to the criticisms already made, the package lacks two essential ingredients: there is no calculator function built into it, so no arithmetic operations can be carried out (the package treats numbers as character strings) and, for a 'computerised' filing system, sorting and searching on only one key field is not good enough.

All in all, this is a very basic, 'noddy' package, though the search and display routines are probably powerful enough to serve as the basis for something better. The listing is not protected and can be seen by entering 'break' and then 'list'.

The program's author reckons that the best way of thinking of this program is as a training aid, a way of coming to grips with the things that 'real' database packages can do (even on a micro). 'I had to write the program — along with several others — in a hurry for the launch of the Dragon. When I get round to it, it will not be too difficult to improve it substantially by giving it the ability to manipulate numbers,' Cornell told me.

Even then, the limited memory of the standard Dragon will keep this a program for enthusiasts, the kind of user who doesn't mind spending ten minutes to power up, load up and look up an address instead of spending 30 seconds looking it up in a good, old fashioned contacts book.

END

FINAL EDITION

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anywhere except at the start of a line. Surely these bugs will be exterminated before the final version of View is completed?

Most drawbacks to the use of View in an office environment are associated with the disk filing system and not faults of the word processor. The maximum length of a title which can be saved onto the disk is seven characters which must not include spaces or punctuation. The maximum number of titles that can be saved on one disk is 31, which can easily be achieved with standard letters on a 200 kbytes disk. The lack of forethought at Acorn when these restrictions were imposed is quite out of character with the quality that has gone into the rest of the design of the BBC micro. These restrictions apply to any disk application and not just View (unless you possess the full Econet system).

If you are familiar with a computer then the introductory text and guide supplied are adequate. With experience you will dispense with the pamphlet and only occasionally need to refer to the guide, which is printed on card rather than paper so it should stand the test of time.

Someone new to a computer or word processor will need quite a bit of help to 'get into' View. If you are thinking of buying View, ensure that the product is actually available at your local dealer. Acorn is no exception in a computer industry fraught with companies that fail to meet production and delivery dates of advertised material.

END

Cursor speed settings

While in the command mode typing *FX 11,20 RETURN will cut the delay time for the first response of the cursor to 20/100th of a second, typing *FX 12,4 RETURN will cut the delay time for repetitions to 4/100th of a second. Try other values instead of the 20 and 4 to suit your requirements but beware of holding down a delete character key if the repetitions are set to a small number of 100th or you will find words disappearing beyond your intentions!

WARNIER ORR PROGRAMMING
PART 2: SETS OF DATA

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occurrences of each item for each set of sample data stored. The equivalent program description shows that a subroutine has to be called 'T' times to collect this analytical test data.

So far I have worked backwards as follows: I took the output required and identified the data items needed to produce the required output. I recognised that this output consisted of two identifiable data types. Firstly, I identified input data items that are not 'manipulated' by the program but are used unchanged. Secondly, I examined the 'derived' data items and by examining the primary items upon which they are dependent I identified further primary items. I used the completed list of the primary data to describe the logical input structure using a Warnier diagram. From this the program that handles this input was designed. I found a close correspondence between the logical structure of the input data and the equivalent program structure.

There is a potential problem arising because the most obvious way to store the input data may not necessarily be the most logical or the most convenient form of dealing with the logical output. It is important now to be aware that I have been talking of the data items as though they are independent, and not restricted by the physical format used to store the data. I will go further than this and say that if these logical design techniques are to be used to their maximum practical potential, then I must ensure that the data is represented in a way that will enable any logical structure required to be imposed without having to rearrange the physical structure of the data.

In a commercial situation there may be many applications programs that operate on various subsets of a company's data. It is therefore advisable to ensure that defined data types from one application do not overlap or duplicate defined data types from another application. In practice there are several ways in which such 'non-redundancy' can be achieved although one technique stands out in its ability to divide a data set into non-overlapping subsets that have the 'flexible independence' qualities that are required. The technique to which I am referring has been around for some time now and is usually connected with database design: it is called 'Normalisation'. The application of a single set of rules enables the logical description of the required independence to be produced which in turn gives the clues needed for the practical solutions.

Next month, I will explain how you can normalise a set of data items and show how this helps create flexible file structures.

END

PINPOINTING THE PROBLEM

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What is not possible, is the selection of fractional orders. To anyone with even a casual knowledge of engineering, it will be recognised that this is a major drawback since so many relationships in the engineering sciences, or indeed in chemistry, pharmacology and biology, are either $X^{0.5}$ or contain some wholly arbitrary fractional exponents, and a curve-fitting routine not offering this facility can only be of limited use.

Other functions

Books such as Borchers' and Poole's (editions of which exist specifically for PET, Tandy and other named machines, to take account of quirks of individual software) give Basic listings for curve-fitting to functions such as:

Exponential fit — ($Y = Ae^{(bX)}$)
Log Fit —($Y = A \log BX$)
Single Power — ($Y = AX^B$)

any one of which may be valuable for specific types of data.

We should also mention here the 'Cubic Spline' fitting program. Stripped of the mathematical aspects (the program fits a series of cubic equations between node points), this draws a smooth curve between points, which may contain as many maxima and minima as are required to give a smooth fit. In a sense, the routine is doing (but perhaps on a less empirical basis) what the draughtsman does with his Flexicurve or French curves. The result has no significance in itself (in contrast to lines or curves formed from a mathematical function) and also it cannot be used (unlike any of the functions above) to extrapolate, but only to interpolate. The best article on this routine was (you might have guessed) in *PCW* (December 1981), and this showed not only typical output, but also listings. Unfortunately, these were in Applesoft and not everyone is acquainted with this language. We therefore show (below) a listing for the BBC, which runs it much faster anyway!

Implementation

The BBC (Model B) is an ideal machine for this type of work. It is faster than almost any other micro (and will be even faster yet when those second processors are hooked up). Since both graph plotting and mathematical solution of some of the higher-order polynomials can be fairly time consuming, this is important. The resolution of the screen (in Mode 4) is as good as most experimentally obtained data merits. In addition, the Acornsoft 'Graphs and Charts' package is invaluable in putting together a program such as this. The EVAL function, which few other micros offer, enables a simple implementation of the 'arbitrary polynomial fit'.

Screen dumping onto an Epson printer is achieved in less than a minute and the resulting quality — with a new ribbon — is good enough for direct reproduction. Figs 2a and 2b show how two sets of data can be plotted and each fitted to a separate mathematical function (which can be printed above the graph, together with a symbol identifier). Further data sets can be added (and plotted according to still another function) as shown in Fig 2b.

The results, both in terms of the graphical display and the equations resulting from curve-fitting are an essential part of many types of research carried on today. True, we could have plotted the data by hand. But fitting it to a theoretical model is something that would have been virtually impossible before the advent of the micro. And for those who send their work out to a commercial artist or draughtsman to be plotted, the savings could just about pay for the micro itself in a year.

References

Some Common Basic Programs (separate editions for PET/CBM and TRS 80 Level II). Lon Poole & Mary Borchers • Osborne/McGraw Hill.
Basic Programs for PET. Tom Rugg & Phil Feldmann • Dilithium Press.

END

FAST AND FRIENDLY

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In order to make full use of the printer a knowledge of programming is required. On the other hand the user-friendly printer programming facility would be adequate for most text needs if used in conjunction with a good word processing package.

Graphics

The MT160L features bit-mapped graphics at 50 or 100 dots per inch. You enter graphics mode by sending an ASCII ESC sequence from the host computer. This sequence describes the density or dpi, and specifies in HEX the total number of graphics bytes to follow.

When this number of bytes has been received, printing begins.

Each byte represents a column of eight vertical dots, and with every line feed the printer moves down an eighth of an inch. You describe each byte as a HEX figure where the most significant bit is the top dot and the least significant bit is the bottom dot. The bit is either off or on although the effect can be inversed like a photo negative using a special facility in graphics mode.

To avoid the tedium of setting up a huge HEX table I'm afraid I cheated and used a demo disk to produce the graphics illustrated. This highlighted another problem. Whereas Peter Rodwell in his Epson QX10 and FX80 reviews last month was able to dump a screen of graphics to the printer by means of pressing a screen dump key, with the MT160L and a Sirius 1 it is more difficult. You need a special program to perform the task, and Mannesmann Tally was unable to provide one.

Paper feed

The MT160L accepts either tractor feed or single sheet stationery. It is easy to thread the paper through but you may not at first realise the importance of the paper thickness control. I had smudgy printing for a while before I tracked down its source. The paper thickness control has to be set to the widest mark when you replace the ribbon. A very odd, half printed, effect is produced if you forget to restore it once the new ribbon is installed. Otherwise changing the ribbon is extremely easy.

Documentation

The manual is brief and well written despite a few literal errors. It gives a detailed description of the hardware and a simple explanation of how to program the machine.

Conclusions

The MT160L costs £599 (exc VAT). It is not cheap especially when compared with the new machines from Epson. The 160cps FX80 costs £430 plus VAT and offers a wider range of options especially in typefaces. However, the MT160L is a neat and well-built machine with a very user-friendly programming facility. Unfortunately it is very noisy. But it produces a clear and nicely rounded typeface which looks good as either draft or correspondence quality.

END

FORTUNE 32:16

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not priced as such and it wouldn't be particularly appropriate in that environment as there are plenty of other micros around which would be far more suitable.

The 32:16 should also prove popular in universities, for the same reasons: it gives students access to a minicomputer and Unix at a very low cost and that's an important consideration in the hard-pressed educational market.

Personally, I developed a sort of love-hate relationship with the machine: sometimes I loved it, sometimes I hated it. I loved its user-friendliness and ease of use at the global level: it's very well thought out and one of the best machines I've ever seen from this point of view. A lot of other manufacturers could learn a lesson or two from this, even without using Unix, hard disks and masses of RAM.

If I had to pass a short and snappy verdict on the Fortune, then, I'd say: nice mini — shame it's not a micro.

END

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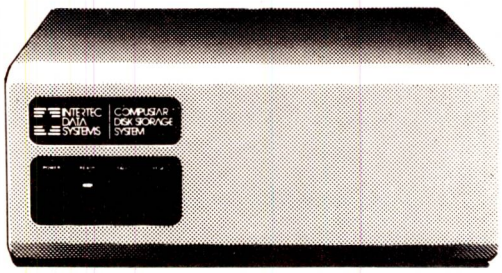

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SPOILT FOR CHOICE

Choosing a computer is a difficult decision. Here Michael Becket gives some straightforward advice to help you ascertain the computer which will best suit your requirements.

Buying a first computer is a total act of faith: it's not just that one does not know the answers, one doesn't even know what questions to ask. The jargon doesn't help simplify matters, either.

The ideal would be to determine what you want from the machine, find the most suitable applications packages, and then select the best and cheapest chunks of electronics on which they would work. But people are put off this obvious course not just by the persuasive publicity, but by the comparative ease with which one can compare physical characteristics. It is almost impossible to sort out the intangible differences between the applications.

As soon as someone has explained the language (see Newcomers Start Here) it is fairly easy to differentiate between Machine A and Machine B. But even low cost computers are quite expensive and if you buy the wrong one you cannot just hand it back — normally. The choice is quite bewildering. There are getting on for 60 computers costing under £1500, of which over 30 are less than £500.

Question time

Firstly, ask yourself the question: why do I want a computer? Do try to be honest — bogus reasons can lead to the wrong choice of machine.

Don't kid yourself computers have a practical use in the home. There is no domestic job which could not be done more quickly, cheaply and efficiently with paper and pencil.

Admit it if what you want is a complex toy that surely must be fun because everybody else seems to have one! So, class one toy is the electromechanical tinkering, and class two is the fun of seeing what the beast can do if you rewrite the instructions to make it go faster. Then there is class three — the computer which will play games.

For the first of these you could well consider buying a kit version of something. Alternatively a vast secondary market has grown up for machines like the Sinclair ZX81 and the BBC Computer — there are enough bits and bobs of add-ons to bump the eventual price up to over £1000 even though the BBC starts at £299 and the Sinclair ZX81 is now a mere £40.

If you want to play games, there is a flood of games software available. The Atari models are outstanding for their range; but the Commodore VIC-20 and 64, Sinclair Spectrum and ZX81 (though you need bolt-on added memory for most of the applications), BBC and even the more expensive Apple have such a large user base that scores of independent companies have produced an enormous variety of programs for them.

The larger the RAM of the computer, the greater the sophistication of the games it can play. The ZX81 has only 1k which means it can do very little; the Apple has 128k which can cope with almost everything. Nearly all computers lie somewhere between these two. Even comparatively complex games seldom need more than 16k of RAM, but if you are keen on colour pictures ('graphics' in the computer world), it might be advisable to opt for 64k; or at least for a machine which can be upgraded to that.

If you want an educational introduction into what computers are and how to program them, the ZX81 will satisfy your needs.

Some traditional book publishing companies are getting in on the act. Collins has started bringing out book/computer cassette combinations for children from the age of four upwards, using a Spectrum to teach them how to tell the time and do elementary maths. Once again it is the popular machines which have the greatest choice of software. Texas Instruments, for example, is making a big effort to increase the educational material available for its machines.

Then, there is business usage. Probably most common is word processing but do ensure that the computer can cope with the full standard screen width of 80 characters, and preferably a length of 25 lines. The Atari 400 and 800, the BBC A, Commodore 64 and Sinclair Spectrum, for instance, cannot. The BBC B, Lynx (currently fighting extensive launch problems), Newbrain and more expensive models can.

Breakdown

If you have a small business a microcomputer could be your salvation. Word processing, however, needs at least 16k of RAM and 'spreadsheet' financial planning packages require between 48k and 64k.

It is not enough to look at the RAM installed — for instance, machines with up to 48k include the VIC-20 which has been selling well at £130 and the Jupiter Ace at £90. Although the former has now been left behind slightly in this competitive market, it has a sufficient wealth of programs to be still in demand.

At the bottom of the range there is the 16k Spectrum costing £99 but with a rubber keyboard on top of a plastic membrane, it is rather unpleasant to use. The Atari 400 at £160 has lots of programs but has a plain flat membrane like the ZX81. (You depress areas marked with letters — it is slow and irritating.) The BBC A is also in this memory bracket but costs an alarming £299. On the other hand it is not only well designed ergonomically; the electronic design is very advanced and sophisticated, enabling the machine to be upgraded, adapted and even supplemented with other calculating chips inserted into it. And both it and the Sinclair machines have rather good instruction books, unlike the notoriously unhelpful Commodore manuals.

One level up at 32k is the Newbrain A. At £190 it is unprepossessing but has been used successfully in business. The BBC B is similar to the A but has more memory and better display for its £399. The Dragon 32 has proved a versatile, well thought out and popular little computer at £200.

And so on up. At 48k there is the Atari 800 at £400 with a proper keyboard; the British Lynx at £225; the Nascom 3 (another British product mainly aimed at business) at £549; and the famous Apple II at £575. At 64k the Commodore 64 (£340) was primarily designed as a home computer, but despite its display limitations is versatile enough to be used for simple business applications.

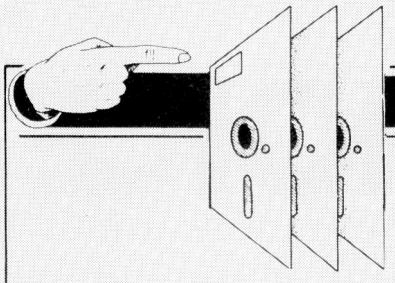
If you are going for a serious business machine on which you can run accounts, prepare letters, do financial forecasting, maintain stock control, and prepare pay slips, etc, you will have to pay at least £500, and almost certainly over £1000. Here cassette input will not cope and you need floppy disks. You will also have to buy sophisticated program packages and a printer.

The difference between these machines is that they have their own displays while cheaper home computers are plugged into the TV. Apple, Commodore, Epson and Cromemco have computers in this bracket, but probably the easiest entry is via the Osborne. All its advertising emphasises portability but at some 28lb you need strong arms to carry it any distance. The Osborne's major advantage is that at around £1437 (and you can get it cheaper if you shop around) it includes — WordStar and SuperCalc.

Incidentally, if you are dead set on portability, there are a growing number of quite elaborate machines in this category. There is the Hyperion/Ajile at over £3000 which can do everything the IBM PC can do but weighs only 25lb; and also the sophisticated Gavilan which is even smaller but lacks a full screen.

Forecasts

People always ask: 'Is this the right time to buy or should I wait a few months for the price to come down?' No, this is not the right time to buy. The technology continues to improve so whatever you buy is certain to be overtaken in price and performance terms — for instance, Acorn is just launching its Electron, a stripped down and cheaper version of the BBC Computer. Buy a reasonably new machine, which provides good value for performance now, and resign yourself to the fact that your neighbour who was a late starter got something more advanced by missing a year or two of fun and use.



PACKAGES

PCW's 'Packages' section is produced bi-monthly, alternating with our 'In Store' hardware guide. We have confined coverage to business packages which are available and supported at national level and which have been in use for at least six months in a minimum of five sites. Producers of packages which fall within these constraints should send details or updates to: ***Tracy Dear, PCW, 62 Oxford Street, London W1.***

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 made available — some may have changed since this issue went to press.

Code	Company	Telephone
A1	ACT	021-454 8585
A2	Arden Data Processing	0533 22255
A3	ADP Network services	01 388 1912
A4	Alamo Comp. Serv.	0642-310381
A5	Anthony Ashpitel	0379 852807
A6	Attar Computers	0942 608844
B1	B + B Computer Ltd.	0204 26644
B2	Beam Business Centre	061-831-7292
B3	Benchmark Computer Systems	0726 61000
B4	Bristol Software Factory	0272 23430
B5	Byte Soft Systems Ltd	0480 215005
B6	Business Solutions Ltd	01-554-0582
B7	Bromley Computer Consultancy	01 697 8933
B8	Business & Administration Systems Ltd	01-953 7303
C1	CAP-CPP Products Ltd.	01-404 0911
C2	Commodore	01-388 5702
C3	Compsoft	0483 39665
C4	Comput-a-crop	0507-604271
C5	Computastore Ltd.	061-832-4761
C6	Computech	01-794 0202
C7	Compass	Standish 426252
C8	CWP Computers	01-828 3127
C9	C4 Computer Services	0632-664313
C10	Caxton Software	01 379 6502
C11	CBS Consultants	021-722-8181
C12	Comp Prog & Systems Serv	0942-38831
C13	Construction Programming Services	0274 688175
C14	Claremont Controls Ltd	0669 21081
D1	Dataview Ltd	0206 869414
E1	Engineering Sciences	01-437-4894
G1	Graffcom Systems Ltd.	01-727 5561
G2	Grama (Winter) Ltd.	01-636 8210
G3	Great Northern	0532 589980
G4	Gecas Micros	01-629 3758
G5	Grade One	Glossop 63819
H1	A.J. Harding	0424 220391
H2	Hartford Software	0606 781156
H3	H.B. Computers	0536 83922
H4	Wordcraft Systems	0332 683892
I1	Intereurope Software Design	0734 786644
I2	Intex Datalog Ltd	0642 781193
J1	T.V. Johnson	0276 20446
K2	Keen Computers	0602 412777
L1	Lifeboat Associates	01-836 9028
L2	EMG	01-688 0088
L3	Ludhouse (Computing) Ltd.	01-749 3834
L4	Logic Comp Systems	01-222-1122
M1	Micro Computer Applications Ltd.	0258 55100
M2	Microtek.	01-300 3075
M3	Microsys Ltd	051 426 7271
M4	Microsave	0272 737555
M5	M.A.P. Comp Systems	061-624-5662
M6	Mercator	0272 731079
M7	Micros For The Movement	01-387 6192
M8	MMG Consultants	06845 63555
M9	Mediatech	01-903 4372
M10	M-TEC Computer Services	060526 620
M11	Micronet	0224 55074
O1	Omicron Design	0784 31809
O2	Open Computer Services	0273 671666
P1	Padmede Computer Services	02514 21892
P2	Personal Computers Ltd.	01-377 1200
P3	Professional Computer Services	061 624 4065
P4	Prestige Computers	021 561 2001
P5	Precision Software	01-330 7166
Q1	Quill Computer Systems.	061 477 4960
R1	Rockliff	051-521 5830
S1	SMG Micro Computers	0474 55813
S2	The Softwarehouse	01-637 2108
S3	Stage One Software	0202 735656
S4	Systematics International	0440 61121
S5	Sumlock Bondain	01-250 0505
S6	Stemmos	01 602 6242
S7	Software Aids Int	01-904 8139
S8	SD Micros	01 836 9520
S9	Southdata Ltd	01-994 6477
S10	Skisoft Computer Services	91 4 76 43
T1	Tridata Micros Ltd.	021 622 6085
T2	Templeman Software	0789 66237
T3	The Micro Solution	0608 3256
T4	Terodec Ltd	0734-664343
T5	TABS Ltd	0264-58933
T6	Tip Data Ltd	0375-33910
V1	Vlasak Electronics Ltd.	0494-448633
V2	Vauntberry Ltd	0329 235846
W1	Wisbech Computer Services	0945 64146
W2	Westfarthing Comp Services	03265-4098
W3	Walters Computer Systems Ltd	04492 70811
W4	Western Computers	0253 404676
X1	Xetal	061 678 0234

APPLICATIONS

Application	Machine	Price	Code
Analysis ledger	Philips P2000	£100	P4
Appointments planner	Act Sirius 1	£115	C7
	Apple II	£300	A6
	Challenger	£25	C7
	CP/M	POR	G4
Arable recording & costing	CP/M	£1500	C4
Architects package	CP/M	£990	M6
Assembler dev	PET/CBM	£50	L2
Auction package	CP/M	£700	M6
BBC Basic	CP/M	£95	M10
	Grundy 8200	£95	M10
Bill of materials	Apple II	£199	T5
	CP/M	£850	B5
	CP/M	£199	T5
	CP/M	£400	G4
	CP/M	£850	V2
	Cromemco	£850	B5
	PET/CBM	£199	T5
	Superbrain	£450	T3
Bookmakers package	CP/M	POR	B7
Bookshop stock control	Sorcerer	£1450	L2
Budgeting package	Apple II	£125	P2
	Apple II	£125	T2
	CP/M	£95	B5
	Cromemco	£95	B5
	North Star Horizon	£95	B5
Building estimating	Apple II	£570	S8
Bunch Books: Computer Listings — 1			
Analysis ledger	Philips P2000	£100	P4
Appointments planner	Act Sirius 1	£115	C7
	Apple II	£300	A6
	Challenger	£25	C7
	CP/M	POR	G4
Arable recording & costing	CP/M	£1500	C4
Architects package	CP/M	£990	M6
Assembler dev	PET/CBM	£50	L2
Auction package	CP/M	£700	M6
BBC Basic	CP/M	£95	M10
	Grundy 8200	£95	M10
Bill of materials	Apple II	£199	T5
	CP/M	£850	B5
	CP/M	£199	T5
	CP/M	£400	G4
	CP/M	£850	V2
	Cromemco	£850	B5
	PET/CBM	£199	T5
	Superbrain	£450	T3
Bookmakers package	CP/M	POR	B7
Bookshop stock control	Sorcerer	£1450	L2
Budgeting package	Apple II	£125	P2
	Apple II	£125	T2
	CP/M	£95	B5
	Cromemco	£95	B5
	North Star Horizon	£95	B5
Building estimating	Apple II	£570	S8
Bureau de change	PET/CBM	£8	H3
Cash flow	Apple II	£125	P2
	Apple II	£80	V1
	Apple II	£100	C8
	CP/M	£250	L3
	CP/M	£95	B5
	Cromemco	£95	B5
	North Star Horizon	£95	B5
	PET/CBM	£195	D1
Bursar package	CP/M	POR	M8
Car showroom sales	Sorcerer	£1900	L2
Cash register	CP/M	£300	T4
Cheque writer	CBM/8032	£90	P3
	PET/CBM	£90	P3
Company secretary	CP/M	£650	C4
Construction cashflow	Apple II	£75	S8
Construction expenditure	Apple II	£250	S8
Construction financial control	Apple II	£750	S8
Construction valuations	Apple II	£500	S8
Container accounting	CP/M	£750	M5
Contract costing	Apple II	£500	P1
	CP/M	£2000	L3
CP/M & utilities	Tandy Model II	£150	M1
Credit control	Apple II	£98	P2
	CP/M	POR	G4
	PET/CBM	£650	B4
Customer file	CP/M	£900	G4
	Famos	£1000	M2
Dairy mangement	CP/M	£1500+	C4
Database management/Information retrieval	ACT800	£225	H4
	Apple II	£150	A2
	Apple II	£150	K2
	Apple II	£60-140	S2
	Apple II	£150	S5
	Apple II	£75	P2
	Apple II	£100	S4
	Apple II	£100	C8
	Apple II	£125	T2
	CP/M	£450	C4
	CP/M	£100	G3
	CP/M	£350	B3
	CP/M	£400	C3
	CP/M	£600	G5
	CP/M	£225-485	S9
	Famos	£1500	M2
	North Star Horizon	£250	B3
	PET/CBM	£250	C3
	PET/CBM	£225	H4
	PET/CBM	£75	B1
	PET/CBM	£50/150	C2
	PET/CBM	£150	J1
	PET/CBM	£150	G2
	Superbrain	£300	S6
	Tandy Model 1	£25-80	M1
	Tandy Model 1	£60	S2
	Tandy Model 1	£150	J1
	Tandy Model 1	£32.50	H1
	Tandy Model 111	£270	A4
	8000 Series	POR	C2
Debt collection	CP/M	£550	G4
	CP/M	£450	V2
Dental laboratory	Apple II	£280	A6
Dental records	Apple II	£395	M4
	Apple II	£1700	A6
	CP/M	£500	T4
Department store order program	Sorcerer	£2500	L2
Disk operating system	PET/CBM	£150	B1
Double glazing costing	North Star Horizon	£750	W1
	CP/M	£1500	V2
Earth parameter collection & Qualification	CP/M	£95	M10
	Grundy 8200	£95	M10
Eire payroll system	CP/M	£650	M5
Engineering/computer-aided design	Apple II	£300	S10
Estate agent	Apple II	£850	A2
	Apple II	£850	S5
	Apple II	£850	K2
	Apple II	£175	P2
	Apple II	£130	C8
	Apple II	£750	S4
	PET/CBM	£30	H3
	CP/M	£700	B5
	CP/M	£850	S9
	CP/M&MP/M	£1500	B8
	PCC 2000 Simpelec Triton 3	£350	B3
	MZ-80K	£195	W1
	Superbrain	£600	S6
	Superbrain	£600	C12
Equipment lease/rent/HP	CP/M	£400	G1
Expense analysis	Philips P2000	£150	P4
Farm accounts	CP/M	£750	C4
Financial & arable management	CP/M	£2200	C4
File handling	PET/CBM	£225	H4
	PET/CBM	£645	D1
Financial modelling	Act Sirius 1	£595	A1
	Apple II	£450	P2
	Apple II	£360	C8
	CP/M	£400	G1
	CP/M	£95	B5
	CP/M	£425-535	A1
	CP/M	£400	B6
	CP/M	£400	V2
	Cromemco	£95	B5
	North Star Horizon	£95	B5
	PET/CBM	£425-535	A1
	PET/CBM	£645	D1
	RAIR Black Box	POR	A3
Financial planning	Act Sirius 1	£150	A1
	Apple II	£250	S4
	CP/M	£245	G4
	UCSD-P	£350	S4
Flare system design		S10	
Fluid flow		S10	
General ledger/NL	Apple II	£300	A2

PACKAGES

Application	Machine	Price	Code
	Apple II	£300	S2
	Apple II	£300	K2
	Apple II	£455	P2
	Apple II	£225	V1
	Apple II	£295	C6
	Apple II	£250P	S4
	Apple II	£600	T2
	Apple II	£490	L4
	Apple II	£199	T5
	CBM/8032	£450	C11
	CBN/8032	£350	W3
	CP/M	£500	L3
	CP/M	£375	L1
	CP/M	£400	G1
	CP/M	£400	M3
	CP/M	£400	B5
	CP/M	£275	S6
	CP/M	£390	S7
	CP/M	£350	B3
	CP/M	£300	W1
	CP/M	£425	B6
	CP/M	£500	T4
	CP/M	£400	M5
	CP/M	POR	B7
	CP/M	£199	T5
	CP/M	£950/1250	V2
	CP/M	£400	M9
	Cromemco	£400	B5
	North Star Horizon	£250	B3
	North Star Horizon PCC 2000	£400	M3
	North Star Horion PCC 2000	£400	B5
	Simpelec Triton 3	£370	B2
	PET/CBM	£200	C2
	PET/CBM	£200	H3
	PET/CBM	£199	T5
	Philips P2000	£100	P4
	Sharp PC3201	£450	P2
	Superbrain	£400	M3
	Superbrain	£400	S6
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	Tandy Model I	£225	H1
	Tandy Model I	£225/325	T1
	Tandy Model II	£425	T1
	UCSD-P	£350	S4
	Vector	£400	C5
	8080/Z80	£357	L1
	8080/Z80	£275	G3
General purchase transaction proc.	CBM/8032	£495	S3
Greyhound race program	Apple II	£750	M6
Health authority PPM	Sorcerer	£2500	L2
Housing association package	PET/CBM	POR	M7
Hotel billing	Philips P2000	£500	P4
Hotel management	Apple II	£525	M4
	CP/M	£525	M4
	RAIR Black Box	POR	A3
Incomplete records	Act Sirius 1	£1200	S1
	Apple II	£250	S2
	Apple II	POR	K2
	Apple II	£425	P2
	Apple II	£450	P1
	Apple II	£490	L4
	CBM/8032	£150	W3
	CP/M	£750	M3
	CP/M	£250	B5
	CP/M	£975	B3
	CP/M	£750	W1
	CP/M	£1250	M5
	CP/M	£155	C10
	CP/M	£400	G4
	Cromemco	£250	B5
	North Star Horizon	£750	M3
	North Star Horizon	£250	B5
	North Star Horizon	£975	B3
	Philips P2000	£150	P4
	Superbrain	£750	M3
	Superbrain	£1200	S1
	Tandy Model 1	£40	M1
	Tandy Model 1	£40	H1
Industrial cleaning package	CP/M	POR	B7
Industry Factory loading	Apple II	£360	X1
	CP/M	£360	X1
	PET/CBM	£300	X1
Industry work study	Apple II	£990	X1
	CP/M	£990	X1
	PET/CBM	£750	X1
Inn Management	Act Sirius 1	£185	C7
Instrument logging	Sorcerer	£500	L2
Insurance broker	Act Sirius 1	£450	C7
	CP/M	POR	G4
Insurance renewals	CBM/8032	£1200	S3
Integrated accts	Act Sirius 1	£795	O1
	Altos (CP/M, MP/M)	£300	B1
	Apple II	£450	P1
	Apple II	£300	P2
	Apple II	£855	V1
	Apple II	£600	T2
	Apple II	£1470	L4
	Apple II	£300	W2
	Apple II	£199	T5
	CBM/8032	£1500	P3
	CBM/8032	900	C11
	CP/M	£950	L1
	CP/M	£750	C4
	CP/M	£1100	G1
	CP/M	£990	M3
	CP/M	£690	B5
	CP/M	£900	B5
	CP/M	£1450	B3
	CP/M	£1200	B6
	CP/M	£199	T5
	CP/M	£3400	M9
	Cromemco	£690	B5
	Cromemco	£900	B5
	Famos	£2000	M2
	MZ-80K	£150	P2
	North Star Horizon	£950	B3
	North Star Horizon	£690	B5
	North Star Horizon	£900	B5
	PET/CBM	£300	B1
	PET/CBM	£800	S3
	PET/CBM	£199	T5
	North Star Horizon	£990	M3
	PET/CBM	(£50)	C2
	PET/CBM	£650	J1
	PET/CBM	£650	G2
	Philips P2000	£650	P4
	Superbrain	£990	M3
	Superbrain	£1200	S6
	Superbrain	£1000	T3
	Superbrain	£1200	S1
	Tandy Model I	£350	M1
	Tandy Model II	£350	M1
	Tandy Model I	£75	J1
	Tandy Model II	£795	O1
	Tandy Model III	£550	A4
	Vector	£1000	C5
	8000 Series	POR	C2
	8080/Z80	£950	L1
	8080/Z80	£995	G3
Investment portfolio	Tandy Model I	£20	S2
Invoicing	Act Sirius 1	£95	C7
	Act Sirius 1	£265	O1
	Act Sirius 1	£195	A1
	Apple II	£295	S2
	Apple II	£300	P1
	Apple II	£300	P2
	Apple II	£140	V1
	Apple II	£300	T2
	Apple II	£199	T5
	Challenger	£25	C7
	CP/M	£325	L1
	CP/M	£250	M3
	CP/M	£250	S7
	CP/M	£100	B5
	CP/M	£200	B3
	CP/M	£300	W1
	CP/M	POR	B7
	CP/M	£199	T5
	CP/M	£400	G4
	CP/M	POR	W4
	CP/M	£400	M9
	Cromemco	£100	B5
	North Star Horizon	£100	B3
	North Star Horizon	£250	M3
	North Star Horizon	£100	B5
	PET/CBM	£350	A1
	PET/CBM	£25-50	B1
	PET/CBM	POR	J1
	PET/CBM	£199	T5
	Philips P2000	£150	P4
	Sorcerer	£290	L2
	Superbrain	£250	M3
	Superbrain	£150	S6
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	Tandy Model I	£25	H1
	Tandy Model I	£75	T1
	Tandy Model II	£125	T1
	Tandy Model II	£265	O1
	Tandy Model III	£280	A4
	UCSD-p	£350	S4
	8080/Z80	£325	L1
Jewellers System	CP/M	£1000	S7
	CP/M	POR	G4
Job costing	Act Sirius 1	£350	C7
	Act Sirius 1	£265	O1
	Apple II	£300	P1
	Apple II	£990	X1
	Apple II	£199	T5
	CBM/8032	£1000	C11
	CBM/8032	£350	W3
	CP/M	£350	M3
	CP/M	£990	X1
	CP/M	£500	T4
	CP/M	£650	M5
	CP/M	POR	B7
	CP/M	£199	T5
	CP/M	£1500	T6
	CP/M	£1500	V2
	North Star Horizon	£350	M3
	PET/CBM	£750	X1
	PET/CBM	£199	T5
	Philips P2000	£400	P4
	Superbrain	£350	M3
	Tandy Model I	POR	M1
	Tandy Model II	POR	M1
	Tandy Model II	£265	O1
	UCSD-p	£350	S4
Job order control	8080/Z80	£275	G3
Legal precedents	CP/M	£1150	C4
Letter writer	Apple II	£80	V1
	Apple II	£99	T5
	CP/M	£150	M3
	CP/M	£99	T5
	CP/M	POR	G4
	North Star Horizon	£150	M3
	Superbrain	£150	M3
Local government housing maint	RAIR Black Box	POR	A3
Lotteries	PET/CBM	£45	H2
Magazine subscriber	CP/M	£950	S9
Mailing List	Altos (CP/M. MP/M)	£75	B1
	Apple II	£300	A2
	Apple II	£50-150	S2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£40	P2
	Apple II	£100	S4
	CP/M	£450	C4
	CP/M	£250	G1
	CP/M	£75	S9
	CP/M	POR	G4
	North Star Horizon	£195	W1
	PET/CBM	£45	H2
	PET/CBM	£15	A1
	PET/CBM	£75	B1
	PET/CBM	£35	H3
	Sorcerer	£290	L2
	Superbrain	£140	C9
	Tandy Model 1	£40	M1
	Tandy Model II	£75	M1
	Tandy Model I	£50-150	S2
	Tandy Model I	£25/38/55	H1
Mail shot	Act Sirius I	£95	A1
	Apple II	£14	S2
	Apple II	£40	P2
	Apple II	£25	T2
	Apple II	£99	T5
	CBM/8032	£350	W3
	Challenger	£25	C7
	CP/M	£450	C4
	CP/M	£90	M3
	CP/M	£100	S7
	CP/M	£50/150	G5
	CP/M	£99	T5
	MCZ Zilog	£250	I1
	North Star Horizon PCC 2000	£90	M3
	Simplec Triton 3	£450	B2
	Superbrain	£90	M3
	Tandy Model I	£75 +	G4
	Tandy Model II	£75	M1
	Tandy Model II	£75 +	G4
	Tandy Model III	£160	A4
Membership accting	Apple II	£75	P2
	CP/M	POR	G4
	MCZ Zilog	£250	I1
	PET/CBM	£85	H2
Motor Dealer	Act Sirius I	£345	C7
	CBM/8032	£950 +	P3
	CP/M	POR	G4
	Famos	£5000	M2
NEDO price adjustment	Apple II	£200	S8
Nominal ledger	CP/M-86	£500	O2
Order entry/ invoicing	Apple II	£99	T5
	CBM/8023	£750	P3
	CP/M	£350	G1
	CP/M	£500	T4
	CP/M	£550	M5
	CP/M	£550	L1
	CP/M	POR	B7
	CP/M	£99	T5
	CP/M	£400	M9
	8080/Z80	£550	L1
Order Processing	AppleII	£99	T5
	CP/M	£99	T5
	CP/M	£500	G4
	CP/M	£400	M9
	Philips P2000	£200	P4
Office admin	Apple II	£100	S4
Pad to plotter systems	Apple II	£250	P2
	Apple II	£180	C8
Payroll	Act Sirius I	£300 +	O1
	Act Sirius I	£195	A1
	Apple II	POR	A2
	Apple II	£200	S2
	Apple II	POR	S5
	Apple II	POR	K2
	Apple II	£200	P2
	Apple II	£375	V1
	Apple II	£375	C6
	Apple II	£250P	S4
	Apple II	£400	T2
	Apple II	£490	L4
	Apple II	£199	T5
	CBM/8032	£375	P3
	CBM/8032	£350	W3
	Challenger	£24	C7
	CP/M	£450	L3
	CP/M	£475	L1
	CP/M	£450	C4
	CP/M	£500	G1
	CP/M	£390	M3
	CP/M	£500	B5
	CP/M	£450	B3

PACKAGES

Application	Machine	Price	Code
	CP/M	£425	B6
	CP/M	Lease	W1
	CP/M	£500	T4
	CP/M	£450	M5
	CP/M	POR	B7
	CP/M	£199	T5
	CP/M	£395	G4
	CP/M	POR	W4
	CP/M	£600	M9
	CP/M-86	£500	O2
	Famos	£1500	M2
	North Star Horizon	£350	B3
	North Star Horizon	£390	M3
	North Star Horizon	Lease	W1
	PET/CBM	£200/350	C5
	PET/CBM	£50/195	I2
	PET/CBM	£150	G2
	PET/CBM	£150	J1
	PET/CBM	£150	C2
	PET/CBM	£10	H3
	PET/CBM	£199	T5
	Philips P2000	£300	P4
	Scorcerer	£250	L2
	Superbrain	£390	M3
	Superbrain	£400	S6
	Superbrain	£250+	T3
	Tandy Model I	£249	M1
	Tandy Model I	£200	H1
	Tandy Model I	£218	T1
	Tandy Model II	£375	T1
	Tandy Model II	£300+	O1
	UCSD-p	£350	S4
	8000 Series	£250	C2
	8080/Z80	£475	L1
	8080/Z80	£275	G3
	PET/CBM	£150	G2
	PET/CBM	£150	J1
	PET/CBM	£150	C2
	Sorcerer	£250	L2
	Tandy Model I	£249	M1
	TRS-80	£200	H1
	TRS-80I	£218	K1
	TRS-80I	£218	T1
	TRS-80II	£375	T1
	8000 Series	£250	C2
	8080/Z80	£475	L1
	8080/Z80	£275	G3
Perpetual Inventory	CP/M	£150	B5
	Cromemco	£150	B5
Personnel records	Apple II	£98	P2
	CP/M	£450	C4
	MCZ Zilog	£400	I1
	PET/CBM	£85	H2
Petaid report generator	PET/CBM	£250	S3
Petsoft programs	PET/CBM	£160	J1
Pig management	CP/M	£1250	C4
Pipeline pressure drops	Apple II		S10
Pipeline sizing	Apple II		S10
Point of sale	CP/M	£400	M9
Postal advertising response package	Apple II	£350	S2
Price lister	PET/CBM	£12	H3
Product Management	Act Sirius I	£245	C7
Production analysis	Apple II	£75	P2
	PET/CBM	£300	B1
Production control	CBM/8032	£650+	P3
	CP/M	£2400	V2
	PET/CBM	£650+	P3
Prof appts groups	8080/Z80	£275	G3
Prof appts individ	8080/Z80	£220	G3
Prof client billing	8080/Z80	£330	G3
Programming aids	Apple II	£40	P2
Property management	Act Sirius I	£1600+	C14
	Apple II, III	£650	C13
	Apple II, III	£650	M11
	CBM/8032	£990+	C14
	CP/M	£750--15000	C4
	CP/M	£400	M3
	CP/M	POR	B7
	CP/M-86	£650	M11
	CP/M-80/86	£650	C13
	DEC Rainbow	£1600+	C14
	IBM PC	£1600+	C14
	North Star Horizon	£400	M3
	Superbrain	£400	M3
	UCSD-p	£175	S4
	Victor 9000	£1600+	C14
Publishers System	CP/M	£1850	S7
Purchase ledger	Act Sirius I	£395	A1
	Apple II	£300	A2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£295	C6
	Apple II	£300	P1
	Apple II	£300	P2
	Apple II	£315	V1
	Apple II	£250P	S4
	Apple II	£300	T2
	Apple II	£490	L4
	Apple II	£199	T5
	Challenger	£25	C7
	CBM/8032	£500	C11
	CBM/8032	£350	W3
	CP/M	£450	G1
	CP/M	£500	L3
	CP/M	£425	L1
	CP/M	£400	M3
	CP/M	£400	B5
	CP/M	£395	S7
	CP/M	350	B3
	CP/M	£300	W1
	CP/M	£425	B6
	CP/M	£500	T4
	CP/M	£400	M5
	CP/M	POR	B7
	CP/M	£199	T5
	CP/M	£950--1250	V2
	CP/M	POR	W4
	CP/M	£400	M9
	CP/M	£400	G4
	CP/M-86	£500	O2
	Cromemco	£400	B5
	North Star Horizon	£250	B3
	North Star Horizon	£400	M3
	North Star Horizon	£400	B5
	Sorcerer	£490	L2
	Superbrain	£400	M3
	Superbrain	£300	S6
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£300	B4
	PET/CBM	£200	C2
	PET/CBM	POR	J1
	PET/CBM	£350	H3
	PET/CBM	£199	T5
	Philips P2000	£200	P4
	Sharp PC3201	£300	P2
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	Tandy Model I	£225	H1
	Tandy Model I	£225	T1
	Tandy Model II	£375	T1
	UCSD-p	£350	S4
	Vector	£400	C5
	8000 Series	£250	C2
	8080/Z80	£275	G3
	8080/Z80	£425	L1
Quotation estimating	Act Sirius I	£125	C7
	Apple II	£300	P1
	CP/M	POR	G4
	Philips P2000	£400	P4
Recruitment Agency	Act Sirius I	£345	C7
Reinforcement bar schedule	Apple II	£150	S8
Relief valve sizing	Apple II		S10
Renewals ledger	Philip P2000	£200	P4
Report generator	CP/M	POR	G4
Requirements planning	CP/M	£700	V2
Resource optimiser	Apple II	£295	C10
Sales ledger	Act Sirius I	£395	A1
	Apple II	£300	A2
	Apple II	£300	S5
	Apple II	£300	K2
	Apple II	£295	C6
	Apple II	£300	P1
	Apple II	£300	P2
	Apple II	£315	V1
	Apple II	£250P	S4
	Apple II	£300	T2
	Apple II	£490	L4
	Apple II	£199	T5
	CBM/8032	£500	C11
	CBM/8032	£350	W3
	Challenger	£25	C7
	CP/M	£450	G1
	CP/M	£500	L3
	CP/M	£425	L1
	CP/M	£400	M3
	CP/M	£400	B5
	CP/M	£365	S7
	CP/M	£350	B3
	CP/M	£300	W1
	CP/M	£425	B6
	CP/M	£500	T4
	CP/M	£400	M5
	CP/M	POR	B7
	CP/M	£199	T5
	CP/M	£400	G4
	CP/M	£950--1250	V2
	CP/M	POR	W4
	CP/M	£400	M9
	CP/M-86	£500	O2
	Cromemco	£400	B5
	North Star Horizon	£250	B3
	North Star Horizon	£400	M3
	North Star Horizon	£400	B5
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£300	B4
	PET/CBM	£800	C1
	PET/CBM	POR	J1
	PET/CBM	£200	C2
	PET/CBM	£350	C7
	PET/CBM	£199	T5
	Philips P2000	£200	P4
	Sharp PC 3201	£300	P2
	Sorcerer	£490	L2
	Superbrain	£400	M3
	Superbrain	£300	S6
	Superbrain	£199	T5
	Tandy Model I	£90	M1
	Tandy Model II	£90	M1
	Tandy Model I	£225	H1
	Tandy Model I	£225	T1
	Tandy Model II	£375	T1
	UCSD-p	£350	S4
	Vector	£400	C5
	8000 Series	£250	C2
	8080/Z80	£275	G3
	8080/Z80	£425	L1
S/L, P/L & stock control	Apple II	£900	P2
	Apple II	£1000	T2
	CP/M	£1000	L3
	CP/M	£900	B5
	CP/M	£900	G4
	CP/M	£1200	M9
	Cromemco	£900	B5
	North Star Horizon	£900	B5
	Philips P2000	£950	P4
Solicitor's complete record accounting	Apple II	£3000	S2
	PET/CBM	£1785	D1
Solicitor's package	Act Sirius 1	£1400	S1
	CBM/8032	£1400	S1
	Compucorp	£2000	Q1
	CP/M	£1250	M5
	CP/M	£750	M6
	Sorcerer	£3500	L2
	Superbrain	£1400	S1
Statistics	Apple II	£150	G3
	Apple II	£100-195	P2
	Apple II	£140	C8
	Tandy Model I	£45	S2
Stock control/ recording	Altos (CP/M, MP/M)	£300	B1
	Act Sirius I	£265	O1
	Act Sirius I	£195	A1
	AppleII	POR	A2
	Apple II	POR	K2
	Apple II	POR	S5
	Apple II	£150	G3
	Apple II	£80	S2
	Apple II	£75/300	P2
	Apple II	£285	V1
	Apple II	£300	P1
	Apple II	£500	S4
	Apple II	£490	L4
	Apple II	£199	T5
	CBM/8032	£175	P3
	CBM/8032	£199	T5
	CBM/8032	£350	W3
	Challenger	£25	C7
	CP/M	£325	L1
	CP/M	£750-1500	C4
	CP/M	£350	G1
	CP/M	£900	M3
	CP/M	£700	B5
	CP/M	£550	B5
	CP/M	£550	B3
	CP/M	£300	W1
	CP/M	£500	T4
	CP/M	£550	M5
	CP/M	POR	B7
	CP/M	£199	T5
	CP/M	£500	G4
	CP/M	£400	M9
	Cromemco	£700	B5
	Famos	£1500	M2
	MZ-80K	£150	P2
	North Star Horizon	£450	B3
	North Star Horizon	£900	M3
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£195	I2
	PET/CBM	£300	B4
	PET/CBM	£15	A2
	PET/CBM	£300	B1
	PET/CBM	£150	C2
	PET/CBM	£150	J1
	PET/CBM	£150	G2
	PET/CBM	£250	R1
	PET/CBM	£35/25	H3
	PET/CBM	£199	T5
	Philips P2000	£300	P4
	Sharp PC3201	£300	P2
	Sorcerer	£390	L2
	Superbrain	£900	M3
	Superbrain	£300	S6
	Superbrain	£450	T3
	Tandy Model I	£30-50	M1
	Tandy Model II	£300	M1
	Tandy Model I	£48	S2
	Tandy Model I	£200	H1
	Tandy Model I	£115	J1
	Tandy Model I	£200	T1
	Tandy Model I	£375	T1
	Tandy Model II	£265	O1
	8080/Z80	£275	G3
	8080/Z80	£325	L1
Storage tank costing/volumes	Apple II	£150	S10
Survey analysis	CP/M	£645	M6
Surveying	CP/M	£500	T4
TAP business system	PET/CBM	£125	H2
Text file librarian	Apple II	£125	S4
Time/cost recording	Act Sirius 1	£800	S1
	Apple II	£450	S2

PACKAGES

Application	Machine	Price	Code
	Apple II	£300	P1
	CBM/8032	£800	S1
	CP/M	£400	G1
	CP/M	£200	M3
	CP/M	£350	B3
	CP/M	POR	G4
	CP/M	£750	M6
	CP/M	POR	W4
	North Star Horizon	£250	B3
	North Star Horizon	£200	M3
	North Star Horizon	£450	W1
	PCC 2000 Simpelec Triton 3	£350	B2
	PET/CBM	£300	B1
	Philips P2000	£300	P4
	Superbrain	£200	M3
	Superbrain	£800	S1
	Tandy Model I	POR	M1
	Tandy Model II	POR	M1
Tour operators package	Sorcerer	£2900	L2
Travel agency accts	Superbrain	£800	S6
Typing tutor	CP/M	£50-125	A5
Utilities	Apple II	£40	P2
	Apple II	£20	C6
	CP/M	£50	B5
	ITT 2020	£20	C6
Utility set	PET/CBM	£78	H3
Various engineering	Tektronix		E1
Various thermal insulation industry systems	CP/M	£2000+	T6
VAT master	PET/CBM	£25	H3
VAT register	Tandy Model I	£15	H1
Video hire system	Act Sirius I	£125	C7
	CP/M	£499	G4
	Tandy Model III	£460	A4
Video message	Apple	£200	G3
Warehousing	CBM/8032	POR	S1
	CBM/8032	£375	P3
Word processing	ACT 800	£375	H4
	Act Sirius I	£295-325	A1
	Act Sirius I	£295+	O1
	Apple II	£60	S2
	Apple II	£75	K2
	Apple II	£75	S5
	Apple II	£75	A2
	Apple II	£150-300	P2
	Apple II	£75	J1
	Apple II	£120	V1
	Apple II	£180/95	S4
	Apple II	£30	C8
	Apple II	£500	T2
	Apple II	£99	T5
	CP/M	£260	C4
	CP/M	£400	G1
	CP/M	£250	M3
	CP/M	£250	B6
	CP/M	POR	B7
	CP/M	£99	T5
	CP/M	£420	V2
	Famos	£500	M2
	North Star Horizon	£250	M3
	PET	£85/65/40/20	H2
	PET/CBM	£375	H4
	PET/CBM	£325	C5
	PET/CBM	£75/150	C2
	PET/CBM	£75/150	J1
	PET/CBM	£75/150	G2
	PET/CBM	£35	H3
	PET/CBM	£249	P5
	Philips P2000	£230	P4
	Superbrain	£250	M3
	Tandy Model I	£50/75	M1
	Tandy Model II	£175-240	M1
	Tandy Model I	£30/60/90	S2
	Tandy Model I	£45/95	J1
	Tandy Model I	£15	H1
	Tandy Model II	£295+	O1
	Vector	£400	C5
	8000 Series	£250	C2
Work In Progress	CP/M	£850	B5

MACHINES

Machine	Application	Price	Code
ACT 800	Database management/	£225	H4
	Word processing	£375	H4
Act Sirius 1	Appointments planner	£115	C7
	Financial modelling	£595	A1
	Financial planning	£150	A1
	Incomplete records	£1200	S1
	Inn Management	£185	C7
	Insurance Broker	£450	C7
	Integrated Accts	£495	A1
	Integrated Accts	£795	O1
	Invoicing	£95	C7
	Invoicing	£265	O1
	Invoicing	£195	A1
	Job Costing	£350	C7
	Job Costing	£265	O1
	Mailing list	£95	A1
	Motor Dealer	£345	C7
	Payroll	£300+	O1
	Payroll	£195	A1
	Project Management	£245	C7
	Project Management	£650	M11
	Purchase ledger	£395	A1
	Quotation Estimating	£125	C7
	Recruitment agency	£345	C7
	Sales Ledger	£395	A1
	Solicitors package	£1400	S1
	Stock control/recording	£265	O1
	Stock control/recording	£195	A1
	Time/cost recording	£800	S1
	Video hire system	£125	C7
	Word processing	£295/325	A1
	Word processing	£295+	O1
Altos (CP/M, MP/M)	Integrated accts	£300	B1
	Mailing list	£75	B1
	Stock control/recording	£300	B1
Apple II	Appointments planner	£300	A6
	Bill of materials	£199	T5
	Budgeting	£125	T2
	Building estimating	£570	S8
	Cash flow	£80	V1
	Cash flow	£75	P2
	Cash flow	£100	C8
	Construction cashflow	£75	S8
	Construction expenditure	£250	S8
	Construction financial control	£750	S8
	Construction valuations	£500	S8
	Contract costing	£450	P1
	Database management/ information retrieval	£150	K2
	Database management/ information retrieval	£150	A2
	Database management/ information retrieval	£60-140	S2
	Database management/ information retrieval	£150	S5
	Database management/ information retrieval	£98	P2
	Database management/ information retrieval	£100	S4
	Database management	£75	P2
	Database management	£100	C8
	Database management	£125	T2
	Dental laboratory	£280	A6
	Dental records	£395	M4
	Dental records	£1700	A6
	Engineering/computer-aided design	£300	S10
	Estate agent	£850	S5
	Estate agent	£850	A2
	Estate agent	£850	K2
	Estate agent	£750	S4
	Estate agent	£130	C8
	Financial modelling	£360	C8
	Financial planning	£250	S4
	Flare system design		S10
	Fluid flow		S10
	General ledger/NL	£300	K2
	General ledger/NL	£300	A2
	General ledger/N/L	£450	P2
	General ledger/NL	£300	S5
	General ledger/NL	£225	V1
	General ledger/NL	£295	C6
	General ledger/NL	£250P	S4
	General ledger/NL	£600	T2
	General ledger/NL	£490	L4
	General ledger/NL	£199	T5
	Greyhound race program	£750	M6
	Hotel management	£525	M4
	Incomplete records	POR	K2
	Incomplete records	£250	S2
	Incomplete records	£450	P1
	Incomplete records	£450	P2
	Incomplete records	£490	L4
	Industry factory loading	£360	X1
	Industry work study	£990	X1
	Integrated accts	£885	V1
	Integrated accts	£450	P1
	Integrated accts	£300	P2
	Integrated accts	£600	T2
	Integrated accts	£300	W2
	Integrated accts	£1470	L4
	Integrated accts	£199	T5
	Invoicing	£295	S2
	Invoicing	£300	P2
	Invoicing	£140	V1
	Invoicing	£300	P1
	Invoicing	£300	T2
	Invoicing	£199	T5
	Job costing	£450	S2
	Job costing	£990	X1
	Job costing	£300	P1
	Job costing	£199	T5
	Letter writer	£99	T5
	Mailing list	£300	K2
	Mailing list	£300	A2
	Mailing list	£40	P2
	Mailing list	£50-150	S2
	Mailing list	£300	S5
	Mailing list	£100	S4
	Mailing List	£25	T2
	Mail shot	£14	S2
	Mail shot	£225	P2
	Mail shot	£99	T5
	NEDO price adjustment	£200	S8
	Order entry/invoicing	£99	T5
	Order Processing	£99	T5
	Pad to plotter system	£250	P2
	Pad to plotter system	£180	C8
	Payroll	POR	S5
	Payroll	POR	K2
	Payroll	POR	A2
	Payroll	£200	S2
	Payroll	£375	V1
	Payroll	£200	P2
	Payroll	£375	C6
	Payroll	£250P	S4
	Payroll	£400	T2
	Payroll	£490	L4
	Payroll	£199	T5
	Personal records	£75	P2
	Pipeline pressure drops		S10
	Pipeline sizing		S10
	Postal advertising response package	£350	S2
	Production analysis	£75	P2
	Programming aids	£40	P2
	Project Management	£650	M11
	Purchase ledger	£300	K2
	Purchase ledger	£300	P2
	Purchase ledger	£300	A2
	Purchase ledger	£300	S5
	Purchase ledger	£315	V1
	Purchase ledger	£300	P1
	Purchase ledger	£295	C6
	Purchase ledger	£250P	S4
	Purchase ledger	£300	T2
	Purchase ledger	£490	L4
	Purchase ledger	£199	T5
	Quotation estimating	£300	P1
	Reinforcement bar schedule	£150	S8
	Relief valve sizing		S10
	Resource optimiser	£295	C10
	Sales ledger	£300	A2
	Sales ledger	£300	K2
	Sales ledger	£300	S5
	Sales ledger	£300	P2
	Sales ledger	£315	V1
	Sales ledger	£300	P1
	Sales ledger	£295	C6
	Sales ledger	£250P	S4
	Sales ledger	£300	T2
	Sales ledger	£490	L4
	Sales ledger	£199	T5
	SL, PL stock control	£1000	T2
	Solicitor's complete record accounting	£3000	S2
	Statistics	£150	G3
	Statistics	£100/195	P2
	Statistics	£100-195	P2
	Statistics	£140	C8
	Stock control/recording	£150	G3
	Stock control/recording	POR	K2
	Stock control/recording	£300	P2
	Stock control/recording	POR	A2
	Stock control/recording	£80	S2
	Stock control/recording	POR	S5
	Stock control/recording	£285	V1
	Stock control/recording	£300	P1
	Stock control/recording	£500	S4
	Stock control/recording	£490	L4
	Stock control/recording	£199	T5
	Storage tank costing/volumes		S10
	Text file librarian	£125	S4
	Time/cost recording	£450	S2
	Time/cost recording	£300	P1
	Utilities	£20	C6
	Video message	£200	G3
	Word processing	£75	K2
	Word processing	£75	A2
	Word processing	£60	S2
	Word processing	£300	P2
	Word processing	£75	S5
	Word processing	£120	V1
	Word processing	£75	J1
	Word processing	£180/95	S4
	Word processing	£30	C8
	Word processing	£500	T2
	Word processing	£99	T5
BBC	Bill of materials	£95	M10
CBM/8032	Cheque writer	£90	P3
	General ledger/NL	£450	C11
	General ledger/NL	£350	W3
	General purpose transaction proc.	£495	S3
	Incomplete records	£150	W3
	Insurance renewals	£1200	S3
	Integrated accts	£1500	P3
	Integrated accts	£900	C11
	Job costing	£1000	C11
	Job costing	£350	W3
	Mailing list	£350	W3
	Motor trader	£950+	P3
	Order entry/invoicing	£750	P3
	Payroll	£375	P3
	Payroll	£350	W3
	Productien control	£650+	P3
	Project Management	£1600+	C14
	Purchase ledger	£500	C11
	Purchase ledger	£350	W3
	Sales ledger	£500	C11
	Sales ledger	£350	W3
	Solicitors package	£140	S1
	Stock control/recording	£175	P3
	Stock control/recording	£250	C11
	Stock control/recording	£350	W3
	Time/cost recording	£800	S1
	Warehousing	£375	P3
Compucorp	Solicitors package	£2000	Q1
Challenger	Appointment Planner	£25	C7
	Invoicing	£25	C7
	Mail Shot	£25	C7
	Payroll	£25	C7
	Purchase Ledger	£25	C7
	Sales Ledger	£25	C7
	Stock Control	£25	C7
CP/M	Appointments planner	POR	G4
	Arable recording & costing	£1500	C4
	Architects package	£990	M6
	Auction package	£700	M6

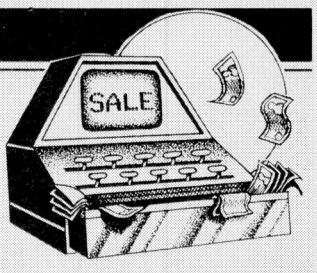
PACKAGES

Machine	Application	Price	Code
	Bill of materials	£500	B5
	Bill of materials	£199	T5
	Bill of materials	£400	G4
	Bill of materials	£850	V2
	Bill of materials	£95	M10
	Bookmakers package	POR	B7
	Budgeting package	£95	B5
	Bursar Package	POR	M8
	Cash flow	£250	L3
	Cash flow	£95	B5
	Cash register	£300	T4
	Company secretary	£650	C4
	Container accounting	£750	M5
	Contract costing	£2000	L3
	Credit control	POR	G4
	Customer file	£900	G4
	Dairy management	£1500 +	C4
	Database	£350	B3
	Database management/ information retrieval	£450	C4
	Database management/ information retrieval	£100	G3
	Database management/ information retrieval	£400	C3
	Database management/ information retrieval	£600	G5
	Database management/ information retrieval	£225-485	S9
	Database management/ information retrieval	£450	V2
	Debt collection	£550	G4
	Dental records	£500	T4
	Double glazing costing	£1500	V2
	Earth parameter collection & quantification	£95	M10
	Eire payroll system	£650	M5
	Equipment lease/rent/ HP	£400	G1
	Estate agent	£700	B5
	Estate agent	£850	S9
	Farm accounts	£750	C4
	Financial & arable management	£220	
	Financial modelling	£400	G1
	Financial modelling	£95	B5
	Financial modelling	£400	B6
	Financial modelling	£400	V2
	Financial planning	£245	G4
	General ledger/NL	£500	L3
	General ledger/NL	£400	G1
	General ledger/NL	£375	L1
	General ledger/NL	£200	B5
	General ledger/NL	£275	S7
	General ledger/NL	£400	M3
	General ledger/NL	£350	B3
	General ledger/NL	£300	W1
	General ledger/NL	£425	B6
	General ledger/NL	£500	T4
	General ledger/NL	£400	M5
	General ledger/NL	POR	B7
	General ledger/NL	£199	T5
	General ledger/NL	£400	M9
	General ledger/NL	£950--1250	V2
	Hotel management	£525	M4
	Incomplete Records	£250	B5
	Incomplete Records	£750	M3
	Incomplete Records	£975	B3
	Incomplete Records	£750	W1
	Incomplete Records	1250	M5
	Incomplete Records	£155	C10
	Incomplete Records	£400	G4
	Industrial cleaner package	POR	B7
	Industry factory loading	£360	X1
	Industry work study	£990	X1
	Insurance brokers	£995	W1
	Insurance broker	POR	G4
	Integrated accts	£750	C4
	Integrated accts	£1100	G1
	Integrated accts	£950	L1
	Integrated accts	£690	B5
	Integrated accts	£850	S7
	Integrated accts	£990	M3
	Integrated accts	£900	B5
	Integrated accts	£1450	B3
	Integrated accts	£1200	B6
	Integrated accts	£199	T5
	Integrated accts	£3400	M9
	Invoicing	£325	L1
	Invoicing	£150	S7
	Invoicing	£250	M3
	Invoicing	£100	B5
	Invoicing	£200	B3
	Invoicing	£300	W1
	Inovicing	POR	B7
	Invoicing	£199	T5
	Invoicing	£400	M9
	Invoicing	POR	W4
	Invoicing	£400	G4
	Jewellers System	£1000	S7
	Jewellers System	POR	G4
	Job costing	£990	X1
	Job costing	£350	M3
	Job costing	£500	T4
	Job costing	£650	M5
	Job costing	POR	B7
	Job costing	£199	T5
	Job costing	£1500	T5
	Job costing	£1500	V2
	Legal precedents	£1150	C4
	Letter writer	£150	M3
	Letter writer	£99	T5
	Letter writer	POR	G4
	Magazine subscriptions	£950	S9
	Mailing list	£450	C4
	Mailing list	£250	G1
	Mailing list	£75	S7
	Mailing list	£75	S9
	Mailing list	POR	G4
	Mail shot	£450	G4
	Mail shot	£90	M3
	Mail shot	£50/150	G5
	Mail shot	£99	T5
	Membership accounting	POR	G4
	Motor dealer	POR	G4
	Order entry/invoicing	£350	G1
	Order entry/invoicing	£500	T4
	Order entry/invoicing	£550	M5
	Order entry/invoicing	POR	B7
	Order entry/invoicing	£99	T5
	Order entry/invoicing	£400	M9
	Order processing	£550	L1
	Order processing	£99	T5
	Order processing	£400	M9
	Order processing	£500	G4
	Payroll	£450	L3
	Payroll	£450	C4
	Payroll	£500	G1
	Payroll	£475	L1
	Payroll	£500	B5
	Payroll	£390	M3
	Payroll	£450	B3
	Payroll	Lease	W1
	Payroll	£425	B6
	Payroll	£500	T4
	Payroll	£450	M5
	Payroll	POR	B7
	Payroll	£199	T5
	Payroll	£600	M9
	Payroll	POR	W4
	Payroll	£395	G4
	Perpetual Inventory	£150	B5
	Personnel records	£450	C4
	Pig management	£1250	C4
	Point of sale	£400	M9
	Production control	£2400	V2
	Production mangagment	£650	M11
	Property management	£750-1250	C4
	Property management	£400	M3
	Property management	POR	B7
	Publishers system	£1850	S7
	Purchase ledger	£500	L3
	Purchase ledger	£450	G1
	Purchase ledger	£425	L1
	Purchase ledger	£200	B5
	Purchase ledger	£275	S7
	Purchase ledger	£400	M3
	Purchase ledger	£350	B3
	Purchase ledger	£300	W1
	Purchase ledger	£425	B6
	Purchase ledger	£500	T4
	Purchase ledger	£400	M5
	Purchase ledger	POR	B7
	Purchase ledger	£400	M9
	Purchase ledger	POR	W4
	Purchase ledger	£400	G4
	Purchase ledger	£950-1250	V2
	Quotation estimating	POR	G4
	Report generator	POR	G4
	Requirements planning	£700	V2
	Sales ledger	£500	L3
	Sales ledger	£450	G1
	Sales ledger	£425	L1
	Sales ledger	£200	B5
	Sales ledger	£275	S7
	Sales ledger	£400	M3
	Sales ledger	£350	B3
	Sales ledger	£300	W1
	Sales ledger	£425	B6
	Sales ledger	£500	T4
	Sales ledger	£400	M5
	Sales ledger	POR	B7
	Sales ledger	£199	T5
	Sales ledger	£400	M9
	Sales ledger	POR	W4
	Sales ledger	£400	G4
	Sales ledger	£950-1250	V2
	Solicitors	£1250	M5
	S/L, P/L + stock control	£1000	L3
	S/L, P/L + stock control	£900	B5
	S/L, P/L + stock control	£1200	M9
	S/L, P/L + stock control	£500	G4
	Stock control/recording	£325	L1
	Stock control/recording	£750-1500	C4
	Stock control/recording	£350	G1
	Stock control/recording	£500	B5
	Stock control/recording	£900	M3
	Stock control/recording	POR	B7
	Stock control/recording	£500	G4
	Stock control	£550	B3
	Stock control	£300	W1
	Stock control	£500	T4
	Stock control	£550	M5
	Stock control	£199	T5
	Stock control	£400	M9
	Survey analysis	£645	M6
	Surveying	£500	T4
	Time/cost recording	£400	G1
	Time/cost recording	£200	M3
	Time/cost recording	POR	W4
	Time/cost recording	POR	G4
	Time/cost recording	£750	M6
	Time ledger	£350	B3
	Typing tutor	£50-125	A5
	Utilities	£50	B5
	Various thermal insullation industry systems	£2000 +	T6
	Video hire system	£499	G4
	Word processing	£400	G1
	Word processing	£260	C4
	Word processing	£250	M3
	Word processing	£250	B6
	Word processing	POR	B7
	Word processing	£99	T5
	Word processing	£420	
	Work in progress	£850	B5
Famos	Customer file	£1000	M2
	Data base	£1500	M2
	Integrated accts	£2000	M2
	Motor dealer	£5000	M2
	Payroll	£1500	M2
	Stock control	£1500	M2
	Word processing	£500	M2
Grundy 8200	Bill of materials	£95	M10
IBMPC	Project management	£1600 +	C14
MCZ Zilog	Earth parameter collection & quantification	£95	M10
Mail shot	£250	I1	
	Membership accting	£250	I1
	Personnel records	£400	I1
MZ-80K	Estate agent	£195	W1
	Integrated accounts	£150	P2
	Stock control/recording	£150	P2
North Star Horizon	Budgeting package	£95	B5
	Cash flow	£95	B5
	Database management/ information retrieval	£250	B3
	Double glazing costing	£750	W1
	Estate agent	£750	B5
	Financial modelling	£95	B5
	General ledger/NL	£250	B3
	General ledger/NL	£400	M3
	General ledger/NL	£400	B5
	Incomplete records	£750	M3
	Incomplete records	£250	B5
	Incomplete records	£975	B3
	Integrated accts	£950	B3
	Integrated accts	£990	M3
	Integrated accts	£690	B5
	Integrated accts	£900	B5
	Invoicing	£100	B3
	Invoicing	£250	M3
	Invoicing	£100	B5
	Job costing	£350	M3
	Letter writer	£150	M3
	Miling List	£195	W1
	Mail shot	£90	M3
	Payroll	£350	B3
	Payroll	£390	M3
	Payroll	Lease	W1
	Property Management	£400	M3
	Purchase ledger	£250	B3
	Purchase ledger	£400	M3
	Purchase ledger	£400	B5
	Sales ledger	£250	B3
	Sales ledger	£400	M3
	Sales ledger	£400	B5
	SL, PL + stock control	£900	B5
	Stock control/recording	£450	B3
	Stock control/recordng	£900	M3
	Time/cost recording	£250	B3
	Time/cost recording	£200	M3
	Time/cost recording	£450	W1
	Word processing	£250	M3
PCC 2000 Simpelec Triton 3	Estate Agent	£350	B2
	General ledger/NL	£350	B2
	Mail Shot	£450	B2
	Purchase ledger	£350	B2
	Sales ledger	£350	B2
	Stock control/recording	£350	B2
	Time/cost recording	£350	B2
PET/CBM	Assembler dev	£50	C2
	Bill of materials	£199	T5
	Bureau de change	£8	H3
	Cash flow	£195	D1
	Cheque writer	£90	P3
	Credit control	£650	B4
	Database management/ information retrieval	£75	B1
	Database management/ information retrieval	£50/150	C2
	Database management/ information retrieval	£150	G2
	Database management/ information retrieval	£150	J1
	Database management/ information retrieval	POR	C1
	Database management/ information retrieval	£225	H4
	Database management/ information retrieval	£250	C3
	Disk operating system	£150	B1
	Estate agent	£30	H3
	File handling	£225	H4
	File handling	£645	D1
	Financial modelling	£645	D1
	General ledger/NL	£200	C2
	General ledger/NL	£1000	C1
	General ledger/NL	£200	H3
	General ledger/NL	£199	T5
	Housing association package	POR	M7
	Industry factory loading	£300	X1
	Industry work study	£750	X1
	Integrated accts	£300	B1
	Integrated accts	£(50)	C2
	Integrated accts	£650	G2
	Integrated accts	£650	J1
	Integrated accts	£800	S3
	Integrated accts	£199	T5
	Invoicing	POR	J1
	Invoicing	£25-50	B1
	Invoicing	£400	C1
	Invoicing	£199	T5
	Job costing	£750	X1
	Job costing	£199	T5
	Lotteries	£45	H2

PACKAGES

Machine	Application	Price	Code
	Mailing list	£75	B1
	Mailing list	£45	H2
	Mailing list	£35	H3
	Membership accting	£85	H2
	Payroll	£150	G2
	Payroll	£150	J1
	Payroll	£150	C2
	Payroll	£50/195	
		195	I2
	Payroll	POR	C1
	Payroll	£200/350	C5
	Payroll	£10	H3
	Payroll	£199	T5
	Personnel recors	£85	H2
	Petsoft programs	£160	J1
	Petaid report generator	£250	S3
	Prise lister	£12	H3
	Production analysis	£300	B1
	Production control	£650+	P3
	Purchase ledger	£200	C2
	Purchase ledger	POR	J1
	Purchase ledger	£1000	C1
	Purchase ledger	£300	B4
	Purchase ledger	£350	H3
	Purchase ledger	£199	T5
	Sales ledger	POR	J1
	Sales ledger	£200	J1
	Sales ledger	£300	B4
	Sales ledger	£800	C1
	Sales ledger	£350	H3
	Sales ledger	£199	T5
	Solicitor's complete record accounting	£3000	S2
	Stock control/recording	£150	C2
	Stock control/recording	£300	B1
	Stock control/recording	£150	G2
	Stock control/recording	£150	J1
	Stock control/recording	£195	I2
	Stock control/recording	£15	A2
	Stock control/recording	£300	B4
	Stock control/recording	£35/25	H3
	Stock control	£199	T5
	TAP business system	£125	H2
	Time/cost recording	£300	B1
	Utility set	£78	H3
	VAT master	£25	H3
	Word processing	£75/150	J1
	Word processing	£75/150	G2
	Word processing	£75/150	C2
	Word processing	£85/65	
		£40/20	H2
	Word processing	£375	H4
	Word processing	£325	C5
	Word processing	£35	H3
	Word processing	£249	P5
PET/ Computhink	Stock control/recording	£250	R1
Philips P200	Analysis ledger	£100	P4
	Expense Analysis	£150	P4
	General ledger/NL	£100	P4
	Hotel billing	£500	P4
	Incomplete records	£150	P4
	Integrated accts	£650	P4
	Invoicing	£150	P4
	Job costing	£400	P4
	Order processing	£200	P4
	Payroll	£300	P4
	Purchase ledger	£200	P4
	Quotation estimating	£400	P4
	Renewals ledger	£200	P4
	Sales ledger	£200	P4
	S/L, P/L stock control	P4	
	Time/cost recording	£300	P4
	Word processing	£230	P4
RAIR Black Box	Financial modelling	POR	A3
	Hotel management	POR	A3
	Local government housing maint.	POR	A3
Sharp PC-3201	General ledger	£450	P2
	Sales ledger	£300	P2
	Purchase ledger	£300	P2
	Stock control	£300	P2
Sorcerer	Bookshop stock control	£1450	L2
	Car showroom sales	£1900	L2
	Department store order program	£2500	L2
	Health authority PPM	£2500	L2
	Instrument logging	£500	L2
	Invoices	£290	L2
	Mailing list	£290	L2
	Payroll	£250	L2
	Purchase Ledger	£490	
	Sales ledger	£490	L2
	Solicitors package	£3500	L2
	Stock control/recording	£390	L2
	Tour operators package	£2900	L2
Superbrain	Bill of materials	£450	T3
	Database	£300	S6
	Estate agent	£800	S6
	General ledger	£400	M3
	General ledger	£400	S6
	Incomplete Records	£750	M3
	Incomplete Records	£1200	S1
	Integrated accts	£1200	S6
	Integrated accts	£990	M3
	Integrated accts	£1000	T3
	Integrated accts	£1200	S1
	Invoicing	£250	M3
	Invoicing	£150	S6
	Job costing	£350	M3
	Letter writer	£150	M3
	Mailing list	£140	C9
	Mail shot	£90	M3
	Payroll	£400	S6
	Payroll	£390	M3
	Payroll	£250+	T3
	Property management	£400	M3
	Purchase ledger	£300	S6
	Purchase ledger	£400	M3
	Sales ledger	£300	S6
	Sales ledger	£400	M3
	Solicitors package	£1400	S1
	Stock control	£300	S6
	Stock control	£900	M3
	Stock control	£450	T3
	Time/cost recording	£800	S1
	Time recording	£200	M3
	Word processing	£250	M3
	Travel agency accts	£800	S6
Tandy Model I	Database management/ information retrieval	£25-80	M1
	Database management/ information retrieval	£270	A4
	Database management/ information retrieval	£60	S2
	Database management/ information retrieval	£32.50	H1
	Database management/ information retrieval	£150	J1
	General ledger/NL	£90	M1
	General ledger/NL	£90	M1
	General ledger/NL	£225	H1
	General ledger/NL	£225/325	T1
	General ledger/NL	£425	T1
	Incomplete records	£40	M1
	Incomplete records	£40	H1
	Invoicing	£90	M1
	Invoicing	£280	A4
	Invoicing	£90	M1
	Invoicing	£75	T1
	Invoicing	£125	T1
	Invoicing	£265	O1
	Integrated accts	£350	M1
	Integrated accts	£550	A4
	Integrated accts	£350	M1
	Integrated accts	£75	J1
	Integrated accts	£795	O1
	Investment portfolio	£20	S2
	Invoicing	£25	H1
	Job costing	POR	M1
	Job costing	POR	M1
	Job costing	£265	O1
	Mailing list	£40	M1
	Mailing list	£75	M1
	Mailing list	£25/38/ 55	H1
	Mailing list	£50-150	S2
	Mail shot	£75+	G4
	Mail shot	£160	A1
	Mail shot	£75	M1
	Mail shot	£75+	G4
	Payroll	£249	M1
	Payroll	£200	H1
	Payroll	£218	T1
	Payroll	£375	T1
	Payroll	£300+	O1
	Purchase ledger	£90	M1
	Purchase ledger	£90	M1
	Purchase ledger	£225	H1
	Purchase ledger	£375	T1
	Purchase ledger	£375	T1
	Sales ledger	£90	M1
	Sales ledger	£90	M1
	Sales ledger	£225	H1
	Sales ledger	£225	T1
	Sales ledger	£375	T1
	Statistics	£45	S2
	Stock control/recording	£30-50	M1
	Stock control/recording	£300	M1
	Stock control/recording	£200	H1
	Stock control/recording	£48	S2
	Stock control/recording	£115	J1
	Stock control/recording	£200	T1
	Stock control/recording	£375	T1
	Stock control/recording	£265	O1
	Time/cost recording	POR	M1
	Time/cost recording	POR	M1
	VAT register	£15	H1
	Video hire system	£460	A4
	Word processing	£50/75	M1
	Word processing	£175-240	M1
	Word processing	£45/95	J1
	Word processing	£15	H1
	Word processing	£30/60/ 90	S2
	Word procesing	£295+	O1
UCSD-p	Financial planning	£350	S4
	General ledger	£350	S4
	Invoicing	£350	S4
	Job costing	£350	S4
	Micro finesse plus	£475	S4
	Payroll	£350	S4
	Purchase ledger	£350	S4
	Sales ledger	£350	S4
	The administrator	£175	S4
	Word Processing	£175	S4
Vector	General ledger/NL	£400	C5
	Integrated accts	£1000	C5
	Purchase ledger	£400	C5
	Sales ledger	£400	C5
	Word processing	£40	C5
Victor 9000	Project management	£1600+	C14
8000 Series	Database management/ information retrieval	POR	C2
	Integrated accts	POR	C2
	Payroll	£250	C2
	Purchase ledger	£250	C2
	Sales ledger	£250	C2
	Word processing	£250	C2
8080/Z80	General ledger/NL	£275	G3
	General ledger/NL	£375	L1
	Integrated accts	£950	L1
	Integrated accts	£995	G3
	Invoicing	£325	L1
	Job order control	£257	G3
	Order processing	£550	L1
	Payroll	£475	L1
	Payroll	£275	G3
	Prof appts groups	£275	G3
	Prof appts individ	£220	G3
	Prof client billing	£330	G3
	Purchase ledger	£425	L1
	Purchase ledger	£275	G3
	Sales ledger	£275	G3
	Sales ledger	£425	L1
	Stock control/recording	£325	L1
	Stock control/recording	£275	G3

TRANSACTION FILE



Readers will be pleased to know that, due to our clever layout ideas, the Transaction File is up-to-date and waiting cut down considerably. Ads are accepted only on the form below for a flat fee of £2.50. Please don't specify issues as we can't oblige. Ads cannot be repeated unless separate forms are sent in. We will only accept entries from non-commercial readers. Thank you for cooperating.

● Casio FX-700P. As new, virtually unused, with manual, program library and case, £65 ono, — Chris Veitch, 22 Clifton Road, Sunderland.

● Commodore 64 with C2N cassette, joystick, RS232 cartridge, games, books and tapes. 2 months old, as new in box. Worth £425+. Sell for £340. Tel: Tony, Gravesend (0474) 823369.

● Sharp MZ-80K 48k RAM 9 months old, manuals, software: Space Invaders, Frogger, etc. £275 ono. Tel: 0908 312735 (North Bucks).

● Sharp MZ80K interface, printer, discs with lots of software £999 or will split. Discs suitable also for MZ80A or MZ80B. Tel: Steve, Basingstoke 0256 771247.

● MZ80K 48k as new. 2/4 meg 1200/2400 baud. External reset. Volume control (no holes in case). Speed Basic, Forth, Master Sargon Chess (4 meg), software, books and more, boxed £280. Tel: 01-737 0814.

● Printer wanted. Good daisy wheel or newish Epson. Also interface for Apple II +. Tel: 031-669 6430. Hignett, Brunstane House, Edinburgh 15.

● Tangerine Microtan 65, fully cased, hex-keypad, and manual. Any reasonable offer considered. Tel: Mansfield (0623) 794446.

● Sharp MZ-80K/A, quality software for sale, 7-Basics, Forth, Pascal, Fortran, 10-m/c games + many others. Worth £300 for only £30. First come first served. Write: 206 South Lambeth Road, London SW8.

● Apple II disk drive Dos 3.3 £150, disk controller Dos 3.2 £30, Integer Card £40, Applesoft Card £40, RS232 communication card £40. Tel: Basildon (0268) 280005.

● Sharp MZ-80K, 48k RAM. Complete with Basic manual and over £60 of software including Knights Commander, toolkit + dust cover. Excellent condition £270. Tel: 0235 73820.

● Epson HX20 portable computer (Cased) with microcassette drive. As new, barely used £425. Also microcassette drive. Brand new, boxed, unused and guaranteed £50. Tel: Colchester 841293.

● Nascom 2 32k 9in rack + cased keyboard £250. Also Creed 7B teleprinter, all parts £25. Tel: West Drayton (08954) 46476 after 17.00.

● MZ-80K/A, Crazy Kong Game. 48k, pure M/C supersound supergraphics, the best M/C game you have ever seen £10. Joerg Lorenz Richardstr 88 1000 Berlin 44, West Germany.

● Apple II + disc drive and controller monitor. Seikosha GP100A and interface as new, boxed, with manuals, disks, etc £800 ono. Tel: Godalming (04868) 7794.

● Sorcerer 56k + Basic ROM Pak w/processor, several games and leads, only £375. Contact Barry, 01-455 0310 work, 01-441 5866 home.

TRANSACTION FILE

● Genie I. One year old, as new. Including £200 software £270. Tel: 067072 646 after 4pm.

● TRS80 16k L2 complete with tape recorder, green screen, CRT, leads, manuals, + Level III Basic Enhancement and Flight Simulator tapes £250. Goodwin, Westerham (51) 63651 after 18.00 hrs (Kent).

● ZX Spectrum 48k, boxed, as new. C/W leads, manuals, etc. £70 worth of software inc. many games + many magazines. Buyer collects. £120 ono. Tel: Brighton (0273) 34158 eves — Ray.

● TRS80 LII, 16k. As new, all leads and manuals + books, games: Galaxy Invasion, etc. £210 ono. Tel: Harpenden (05827) 61239.

● Newbrain model AD with manual. £200. Sanyo high resolution green monitor, 12in non-reflecting screen £95. Both with under 10 hours use. Tel: Bristol 690345. J.C. Aitken, 47 Elm Close, Littlestoke, Bristol.

● ZX Spectrum 48k. Excellent condition, complete with ZX printer, professional case, sound amplifier and about 20 games + mags. For only £215 ono. Tel: 01-771 2377 (Mr. Whitney after 8pm).

● Tabs accounting and payroll modules (for Apple II with twin disks). Regret must sell. Tel: Grimsby 824238 for details and low price.

● Video Genie EG3003 16k, new keyboard, integral cassette, VU meter. Excellent condition, hardly used. Complete with original manuals, leads, box, some programs (Space Invaders, Scrambler, etc). £210. Tel: 0945 582432 after 5pm.

● Wanted vintage calculator: Texas Instruments SR56 with or without print cradle, PC100. Must be in full working order. SR52 considered. E. R. Ashley, 23 Brook Way, Bromham, Bedfordshire MK43 8PG. Tel: 02302 5114.

● Aculab TRS-80, Floppy tape drive and Zen, Xbas, locase, 21 wafers, manulas. Aculab TRS-1 parallel port printer interface: TRS-80 Level II instruction course part II, 4 cassettes. Any reasonable offers considered. Tel: (0753) 882982.

● Tangerine system in 19in rack, switch mode power supply, processor card, Tanex, Tanram, 2 hi-res graphics boards, eprom programmer, eprom storage board, keyboard. Real bargain at £300. Tel: 0242 510525.

● Intertec Superbrain 64k, integral screen and disk drives. CP/M, Extended Basic, Supercalc. Microline printer, £750 ono. Mike Bryant. Tel: Reading (0734) 65724.

● MZ-80K perfect condition. Basic and Pascal compilers together with instruction manuals on both. 48k + screen and cassette inbuilt £325 ono. Tel: (Kenilworth) 0926 59658 anytime.

● PET 32k cassette player, light pen, and sound box + manuals and PET Revealed toolkit. Reset button, lots of programs. All in good condition £340. Tel: Heath, Hayes 74831.

● UK101/Superboard 256 programmable graphics. New. Built on photo-resist board. Demo software, circuit diagram and documentation included. Send £69 to D. Lewis, 190 Liverpool Road South, Burscough, Lancashire L40 7RF. Tel: (0704) 892825.

● Servogor 281 Flatbed graph plotter, A3/8 colour programmable pen selection. RS232 or IEEE488 interfaces produces high resolution. Hard copy graphs etc £1,700. Tel: 01-794 7024 anytime.

● Hewlett-Packard HP10C programmable calculator. Brand new and hardly used £48. Tel: Redhill 71349.

● Apple II+ 48k, disk drive, Silentype printer, language card, 12in Hitachi monitor, Dos toolkit, Visicalc, E-Z draw, games, etc £1,300 ono. Tel: Tadworth 2746.

● Apple II software for sale or exchange. Visidex, Apple Pascal, Apple Writer, Apple Plot, Apple Post, Graphics and games. Wanted Logo, Mountain Music Cards, games, etc. Tel: 021-744 3355.

● Sharp MZ-80K computer. As new, 4 MHX upgrade, reset switch, with Basic, Pascal, Forth, Fortran, Disassembler and hundreds of games, along with Sharp literature, books, etc. Bargain at £390. Tel: 07982 2596.

● BBC Model B, hardly used. £370. Texas 810 printer, £500, £40 worth of software, £20. Will accept an offer for the lot. Tel: Flitwick (0525) 717337.

● Nascom 2 48k G802 graphics, Basic Zeap, homemade case, Ferguson cassette player, many tapes, 14in Sanyo TV modified for video. Owner going abroad. First offer over £500. Tel: Reading (0734) 476035.

● MZ-80K complete system. I/O box, dual disc drives. P.3 printer, X/Tal card, CP/M modified, F.Dos, Double Precision Basic, Forth, workshop manuals, leads + lots of extras £999 ono. Tel: Southampton 774384.

● Wordcraft, word processing cartridge for VIC 20 unused and in sealed packing, cost £125 accept £75 ono or exchange for VIC 20 Mother Board. Tel: 01-242 7100 daytime, REF RCH.

● Atari and Spectrum games for sale. VCS carts, Starmaster SI Invader, M/Command, ask for others £15.10. Abacus 'Avenger', Silversoft 'Orbiter' both for 16k. Contact Danny anytime, Wellingborough 673261.

● Video Genie EG3003 16k. In box with all leads. Arrow keys, VU meter and integral cassette, with sound. £100 software. Will accept £220 ono. Tel: 051-526 4885 (Maghull, Merseyside).

● TRS80 + 32k. Interface + disk drive + IBM Goltball with interface £700. Heathkit ET3400 as in Maplin. As new, assembled with course notes £200. Tel: 01-607 6945 after 6.30. Julian, Flat 7.

● Microtan processor, Tannex, motherboard, keyboard and monitor in custom-built VDU case + software and Eprom programmer £235. ASR33 terminal, floorstand and manuals £65. Tel: Ramsey (Cambs) 831967.

● DAI personal computer, 48k RAM hi-res graphics, stereo sound, 16 colours, etc + some tapes and books, £250 ono. 263 Cpl Boyd, 26 SU, R.A.F. B.F.P.O. 45. Postal sale only (computer in Germany).

● A113 16-channel 12-Bit analog Input system for Apple II with manual and demo diskette £275 ono. Also A102 16-channel 8-Bit A-D system £125 ono. Tel: 061-796 6992.

● Sharp PC3201 business software wanted. Buy or swap CP/M operating system programs. Want database and complete accounts package. What have you to offer? Contact Peter Hodgkinson. Tel: Leyland (07744) 23221.

● CBM 3008 32k. Excellent condition, including cassette recorder, games, Basic tutor, "SIMPLICALC", £40 worth of manuals, internal sound box with volume control £420 ono. Tel: Ponteland (0661) 22724.

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● PET 2001 32k new and old ROMs, integral cassette, programmers, toolkit. Many programs including Pet Tutor and a word processing program and games £275. Tel: Reading (0734) 790184 anytime.

● Epson HX20, 32k, expansion unit, microcassette drive, transformer, carrying case. As new £350 ono for quick sale. Tel: Colchester (0206) 865557.

● SUPERBRAIN 64k, dual disc drives, CP/M, MBasic, with Anadex DP8000 printer, £1,000. APPLE II 64k, dual disc drives, 80-column card, monitor, £1,000. Tel: 021-355 1303.

● Wanted Microtan system rack, Tanram, SMB, HRG, etc. Must be Tangerine built. Tel: Tarland (033981) 221 (Scotland).

● PET 4032, 12in VDU, 32k memory, 18 months old, as new. Commodore cassette machine. PET/CBM guide and PET Revealed. PET Basic £425. Tel: Harefield (Middlesex) (STD 420) 4758 eves/weekends.

● TRS-80 model 1, level 2, 16k. With video display, cassette recorder, leads, software and books £315. TRS-80 Exatron stringy floppy high speed tape unit (connects directly to keyboard) £110. Tel: Hornchurch 44413 eves.

● Apple II Europlus, D/drive, monitor III, Epson MX80 III, 80 col, Applewriter Visicalc, database games, others. 12 months home use only £1,200. Mackay, 122 Maisemore, Redditch B98 9LP. Tel: 0527 69887.

● OKI IF-800 mode L2O, 1 year old, perfect machine, colour, screen 640×200 graphics, 80 CPS printer, two 5¼in floppies £2,200. Tel: 01-656 4287.

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● BBC model B with software and cassette cable. Hardly used, unwanted gift. Please make an offer. Tel: Angeline, 01-703 4621 eve and weekends.

● Epson HX-20 portable computer complete with micro-cassette drive. Integral printer, P.S.U. and transit case. Worth £540 new, will sell for £380. Tel: 01-552 1772 after 6.30pm (Ian).

● Osborne 1, + DBas 2, as new, complete with Wordstar, Supercalc, C/Basic, Microsoft Basic + CP/M. 3 weeks use only! Complete with comprehensive manual. Absolutely perfect condition. £835+VAT. Guaranteed. Tel: 01-904 4450.

● TRS80 M1 LII, 48k RAM, E I 32k, VDU, L P III, (120 CPS), CTR80, Hi Res box, W P. Mint condition. Very impressive with special desk. Sold as a package or parts. Great bargain. Call Walton (09322) 43707.

● BBC model B, disk interface, BBC recorder, Seikosha GP100A, printer, most Acornsoft and superior software. Little used. Emigration forces reluctant sale. £575 ono, may split. Tel: Steve, 01-668 8342.

● Sharp MZ-80A and MZ-80K cassettes. Converters A/K and K/A, append renumber, Databank, Inventory, Invoices. All £6. Wordpro £10, games £3. SAE for full list. 38 South Parade, Bramhall, Stockport SK7 3BJ.

● Model 43 keyboard send receive printer, Traction + friction feed, for Modem or most micros. RS232 or current loop. Perfect. £375 ono. Tel: Emsworth (02434) 5740.

● Sharp PC-1251 computer with CE-125 printer micro cassette "A5" book size. Personal computer system as new with programs etc and mains adaptor, carrying case £145. Tel: Office 0227 67845, home 0233 35597.

● UK101 8k RAM cased. 300 baud cassette, much software inc. Astrosled. All leads, + PIA Eprog. For quick sale £110 ono. Tel: 0474 814717 eve.

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● Superboard II cased, 8k, 32×48 screen, Cegmon, Basic 5, Basic X, toolkit, hi-speed cassette interface, software, manuals, £120 ono. Delivery free. Tel: 021-744 4879 after 6pm.

● Assemblers on 32k PET + disc. Fast 200 LPM. 6801 3, 6301/3, 6802, 6809 £18 each, processor, SAE details. M.J. Tyler, 2 Parkview Drive, Cashes Green, Stroud, Glos, GL5 4NQ. Tel: 04536 77257.

● ZX81 + 16k complete, Sinc built. Books: ZX81 companion, Mastering M/C on ZX81 and Hints and Tips for ZX81. Programs: Assembler, games, home and business. £55. Tel: (093 23) 44943.

● BBC micro model B with cassette recorder, games, leads etc, new condition £350. Tel: 01-727 3199.

● Apple II Europlus complete with disc-drive and controller, 16k memory card, games, paddles, some software. All in as new condition, £750. Tel: Bhatti, 01-527 2350 ext-54 office hours, 01-574 5038 after 7pm.

● Apple II Europlus, 64k, disk drive, TV modulator, RAM card, Mountain Hardware Music System — Best around, £1000 ono. All 9-voice Apple Music Card, £60 ono. Tel: (089-272) 3579.

● Video Genie, 16k RAM + feature ROM. Hi-Res and sound. Over £80 of software inc. Assembler, compiler and games. Boxed with leads. Worth £550. Offers £310. Tel: 0978 761347 after 4 p.m.

● Acorn ATOM 12k RAM + 12k ROM complete with leads, 3 books and software which includes 'Galaxian', excellent condition. Sell for £125. Tel: 0239 612821 (Cardigan) after 4.30 p.m.

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● Sharp MZ-80k. One year old with X-Tal Basic + some software boxed £350 ono. A Corthine, 95 Whitehorse Hill, Chislehurst, Kent. Tel: 01-468 7021, (day) 01-467 7161 eve.

● Eight hole punch and readdr with NCR accounting machine control unit, including substantial power supplies, zx12v and zx24v at 20A £25 each £40 both. Tel: Leeds 665 884. Plows.

● Sharp CE-151, 4k RAM module for PC-1500, guaranteed working condition, £30. Milne, 34, Yeovil Road, Franborough, Hants, GU14 6LB.

● Software for Sharp MZ-80k. X-Basic, Forth, Pascal, Fortran, M/C, 150 progs including: 6 Adventures, Disassembler, Scramble, Cribbage, Chess etc. £70. May separate. J.Chan, 318 Great Western Street, Moss-side, Manchester M14 4LP. Weekends 061226 4364.

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● Apple II, Europlus, 48k, disk drive, Joystick, manuals, software, etc. 8 months old excellent condition. UHF modulator — use with TV or monitor. £750 Tel: Berkhamsted (04427) 5570.

● North Star format software to clear (cheap) E.G. CP/M V2.2, MAC SID, Wordstar, M/Merge, Calestar Supersort, M/Basic, Fortran, Bstam etc. Also North Star, Dos Software. Enquire quickly. Tel: Crawley 515201.

● CBM PET 3032, Disc Drive CMB 3040 NEC Spinwriter 5510 daisey wheel letter quality printer, RS232 interface (two) CMB cassete deck, programs, Visicle. All £1000. Tel: 01-226 4856 (office) Miller Williams.

● TRS-80 16k, L2, monitor single disc drive — micropolis, manuals and games. Tel: 0272 716351 day, 0272 292350 eve, F. Martin. £300.

● Applewriter 1.1 £25, Visicalc £75, relocated integer £10, Talking disk £10, Omnifont (Applewriter Epson) £15. Original disks/documentation (not illicit copies) £120 the lot (worth double). Tel: Northampton 0604 858395.

● PET 3032, green screen, large keyboard, new ROM, cassette drive, dust cover, reset switch, toolkit, superchip, Assembler, Disassembler, chips, 40+ games, quality soundbox, books, good condition £475 ono. Tel: Northwood 22558.

● Gemini Eprom board (suits Nascom). £50. Tel: 0357 21672 ask for John (after 6pm please).

● Spectrum 16k + Spectral Invaders tape, £125. Bought early February, little used. Not really suitable for my needs. Tel: Marcus 730 8504 (London) between 6-7pm only please.

● BBC model 'B' with single 200k disc drive. 1·2 OS and Acorn disc OS(DFS). Wordprocessor ROM (Wordwise). All manuals and 10 floppy discs included. £800. Tel: 0225 742489 after 6pm.

● Televideo display computer terminal 912C, full upper lower case RS232, interface speed 75-9600 with operators maintenance manual. As new condition £300. Tel: 01-908 0501 (eves).

● Atari 400 16k, almost new. Cassette player, Basic manuals, joy sticks, – several games. All only 3 months old. Must sell £185 ono. Tel: 368 1034.

● FX702P pocket computer + printer + cassette interface + paper, all new. Guaranteed paid £150, sell £100 ono urgent. N. Ryman-Tubb, 6 Highcliffe Drive, Allbrook, Eastleigh, Hants. Tel: (0703) 615414. Also Nascom1 £65 ono.

● Hobbit microcassette deck £295. Includes free Nascom1 with 48k, graphics, Zeap, NAS-SYS Eprom programmer, adventure, Magazines and documentation parts for SA PSU. Nicely boxed. Tel: Macclesfield 72988 after 6pm.

● Sharp MZ80K wanted. Exchange for H-H 100 watt professional guitar amplifier top, and H-H 200 watt (4 x 12) speaker cabinet + Watkins copycat echo unit. Croydon 01-651 1746.

● Atari bargains: Jumbo, Jet Pilot cartridge, £23.50; Galactic Chase cassette, £12.50; both in excellent condition. Tel: 0793 750620, ask for Rob.

● MZ80K 48k graphical adventure game, The Golden Staff, Travel Through Kalania To Reach Your Goal. Also Hopper (arcade type game) £5. M. Dyas 10 Apollo Way, Netherton, Merseyside, L30 7PH.

● Verbatim Datalife floppy disks 5¼in, virtually new, most unused. SSDD soft-sectored, 77/80 tracks, 100/96 TPI. Total 58 disks £110. Tel: Richard Jones 01-311 2982.

● Nascom2 32k, NASYS-3, Zeap, Graphics, Bits & PCS toolkit ROM, games, manuals. Professionally built, Kenilworth case. Must sell so no sensible offer refused. Will deliver East Anglia/London. Tel: 035387-724.

● Apple II Europlus 48k, TV modulator, disc drive, and controller Dos tool kit, + manuals £800. Tel: 051 734 2054 after six.

● Microtan 65, Tanex, Basic, XBug, 10k RAM, T.U.G, P.G.M., and toolkit. Full ASCII keyboard, hex keypad, PSU. Rack mounted, some software T.U.G. newsletters, all manuals £250 ono. Tel: 0908 315418.

● MZ80A/K owners protect your software with Eurolock MkII, makes programs unlistable, unbreakable and uncopyable. Instructions supplied £4. Also Pools Analysis/Prediction £5. Write: N. Alam 220 Gisburn Road, Higherford, Lancs, BB9 6AU.

● Sharp MZ80K, 48k, + P3 printer, I/O interface, green screen, reset button, dust cover, manuals, 100+ programs, Knight Commander, Basic, Forth, Pascal, Word Processor. Complete, £595, no offers. Tel: Maidstone (0622) 54537.

● 64k VIC-20 + C2N cassette recorder + joystick + games + VIC Revealed book, worth £300, sell for £200 ono. Tel: 01-764 6276.

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● UK101 (Wemon), cased, 16k RAM, 12k Basic, extended monitor in Eprom, Centronics port + 2-byte I/O port, new power supply, full documentation, £120 ono. Tel: Hitchin (0462) 56714 (eve).

● PET 4032, toolkit, cassette, 40 games programs, manuals, all in excellent condition, £350 ovno. Beverley, Shore Lane, Bishop's Waltham, Hants. Tel: Bishop's Waltham 4068.

● Apple Europlus computer, twin disk drives, Epson MX-80IIIF/T printer, BMC monitor, complete tabs, business system payroll, purchase sales and nominal ledgers, 5 months, little used, £1,500 ono. Tel: Sandwich 612869 (Kent).

● DAI 48k, 16 colours, improved keyboard, and user mags, £525 ono. Tel: 01-670 5909 (Dulwich).

● Olivetti Praxis 35 typewriter (easily convertible to computer printer), excellent quality daisywheel, £200; also Texas T159 programmable calculator with 3 ROMs, (maths, statistics, electronics), + manuals, £100. Tel: Bristol 48663 eve.

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● ZX81 + 16k + amazing Fuller professional keyboard and £45 of software, including Defender, Invaders, Star Trek etc. All leads, manuals, books supplied, bargain for £90. Tel: Steve on 01-859 2360.

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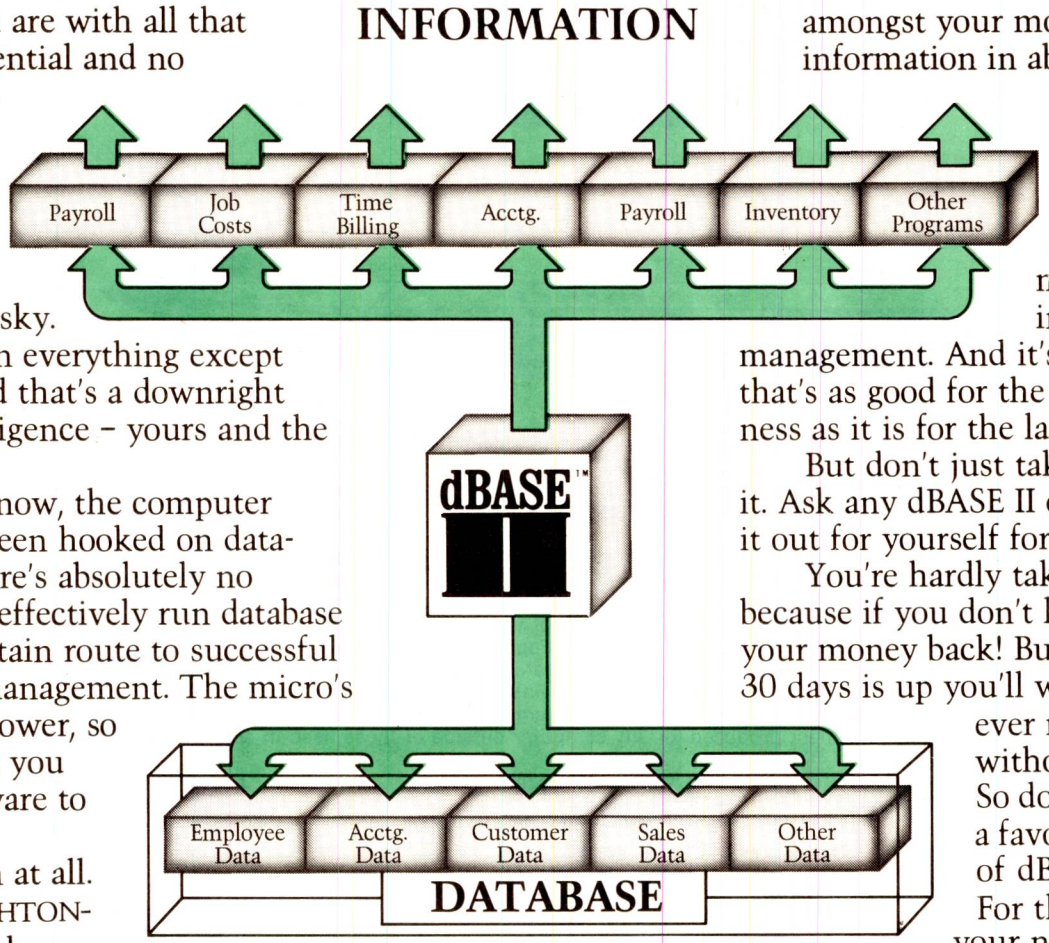

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Software News

INNOVATIVE
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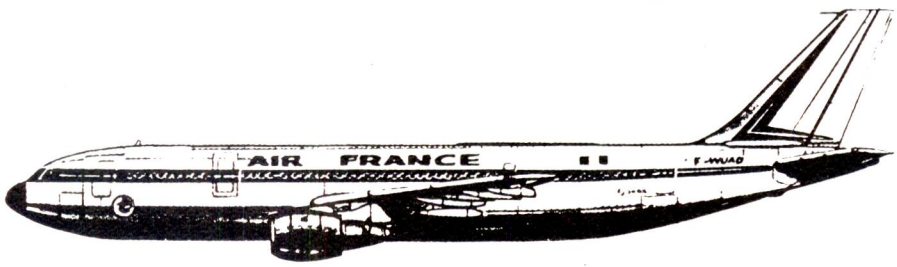
from the professionals

AIRBUS



Airbus continues the line of highly accurate flying simulators stocked by Molimerx. It follows in the footsteps of Shuttle and Jumbo.

The Airbus A300 is a twin engine, wide bodied jet manufactured in Europe. There are many models. The specimen chosen by the author is that powered by two General Electric CF6-50C2 turbo fans with a maximum seating of 330 and maximum all up take-off weight of 140,000 kg.

We only stock simulations which are precise models of the original, and Airbus is no exception. Indeed, Airbus could be said in some respects to be a more accurate simulation of flying the aircraft than was Jumbo, and the latter certainly set new standards in this area. The big difference between the two is that Airbus incorporates radio navigation. Five VOR's or Omnis (radio direction beacons) are included in the simulation, all of them in the Holland/Belgium/Germany area. Furthermore, they all include Distance Measuring Equipment facilities. Four runways at three airports are available for landing and take-off. Airbus also includes randomised engine failure simulation.

Like Jumbo, Airbus is flown on instruments and only on instruments. Some of these are graphic representations of instruments. One of them is the Instrument Landing System instrument. This, without a doubt, is the best graphic representation of such an instrument produced for any computer outside of those used in actual aircraft themselves. There are 31 instruments in all:

1. Indicated air speed gauge
2. Artificial horizon
3. Power setting for No. 1 engine
4. Power setting for No. 2 engine
5. Slat setting
6. Flap setting
7. Compass
8. VOR tracking instrument
9. Instrument Landing System
10. Clock
11. All up weight
12. Fuel
13. Fuel flow
14. Vertical speed indicator
15. MACH speed
16. Precise pitch
17. Precise roll
18. Altimeter
19. Landing gear status
20. Nose wheel status
21. Wheel brakes status
22. Air brakes status
23. True air speed
24. Wind direction and velocity
25. Ground speed
26. Destination runway, place & number
27. Distance to go
28. Precise heading
29. Precise track
30. Data from No. 1 DME/VOR
31. Data from No. 2 DME/VOR

An extensive illustrated manual is supplied comprising some 27 pages. It takes the reader through the control panel in general and then in detail. Discusses the controls at length; general discussions are held on flying technique of Airbus and then simple flight manoeuvres are described, such as normal take-off, noise abatement take-off, take-off with engine failure, climb, cruise, turning, descent, approach, final approach and landing. Procedures in overshoots and engine out emergencies in various situations are described. Two pages of simple flight briefings, in other words, instructions for suggested flights, are included. There are seven Appendices, including detailed discussions of the VOR/DME navigation system and the ILS approach system. Purchasers of Airbus may also buy the educational section of the Jumbo manual for £1 if they wish.

The program is compiled Basic and is disk orientated only. The compilation enabled the author to include very precise slow down loops in the source code. Thus as we have said, the simulation is as exact as it is possible to get. The compatibility of the program with various disk operating systems and machines will depend upon the compatibility of those DOS's and machines with the Microsoft Compiler. As far as we know, on TRSDOS it is compatible on all Genie machines (with the exception of the Model III) and of course the Tandy Model I. It is also compatible with LDOS on these machines. On the Tandy Model III the choice of DOS is somewhat more crucial as many disk operating systems running on that machine are not compatible. TRSDOS 1.3, for instance, is not. A patched version of the run time file, to enable use on the Model III under LDOS or smal-LDOS is included in the package.

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TRANSACTION FILE

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● Sharp PC1211 including printer and cassette interface with spare paper etc, not used much, bargain, £100. Tel: Graham on 021-421 5372 after 7pm.

● Sharp PC1500, almost new. Tel: Graham on 021-421 5372 after 7pm.

● Casio FX702P, hardly used, bargain, £50. Tel: Graham on 021-421 5372 after 7pm.

● CP/M maker for Atari 400/800, encased with power supply. Provides RS232 parallel, standard, Atari disc interfaces, 64k, connects up to 4 (mixed) drives software included CP/M 2.2, £390. Tel: Luton 32752.

● Teac dual cased 100k disc drives, still under guarantee, complete with cable, utilities disc and manual for BBC micro, £220 ono. Tel: 0782 314053 after 6pm.

● Televideo display computer terminal 912C, full upper lower case RS232, interface speed 75-9600 with operators maintenance manual. As new condition £300. Tel: 01-908 0501 (eves).

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● BBC model 'B' with single 200k disc drive, 1·2 OS and Acorn disc OS(DFS), Wordprocessor ROM (Wordwise). All manuals and 10 floppy discs included. £800. Tel: 0225 742489 after 6pm.

● Hobbit microcassette deck £295. Includes free Nascom1 with 48k, graphics, Zeap, NAS-SYS Eprom programmer, adventure. Magazines and documentation parts for SA PSU. Nicely boxed. Tel: Macclesfield 72988 after 6pm.

● Sharp MZ80K wanted. Exchange for H-H 100 watt professional guitar amplifier top, and H-H 200 watt (4 x 12) speaker cabinet + Watkins copycat echo unit. Croydon 01-651 1746.

● MZ80K 48k graphical adventure game, The Golden Staff, Travel Through Kalania To Reach Your Goal. Also Hopper (arcade type game) £5. M. Dyas 10 Apollo Way, Netherton, Merseyside, L30 7PH.

● Verbatim Datafile floppy disks 5¼in, virtually new, most unused, SSDD soft-sectored, 77/80 tracks, 100/96 TPI, Total 58 disks £110. Tel: Richard Jones 01-311 2982.

● FX702P pocket computer + printer + cassette interface + paper, all new. Guaranteed paid £150, sell £100 ono urgent. N. Ryman-Tubb, 6 Highcliffe Drive, Allbrook, Eastleigh, Hants. Tel: (0703) 615414. Also Nascom1 £65 ono.

● MZ80A/K owners protect your software with Eurolock MkII, makes programs unlistable, unbreakable and uncopyable. Instructions supplied £4. Also Pools Analysis/Prediction £5. Write: N. Alam 220 Gisburn Road, Higherford, Lancs, BB9 6AU.

● Sharp MZ80K, 48k, + P3 printer, I/O interface, green screen, reset button, dust cover, manuals, 100+ programs, Knight Commander, Basic, Forth, Pascal, Word Processor. Complete, £595, no offers. Tel: Maidstone (0622) 54537.

● 64k VIC-20 + C2N cassette recorder + joystick + games + VIC Revealed book, worth £300, sell for £200 ono. Tel: 01-764 6276.

● Sharp MZ80K, 48k, extended Basic + software including M C Pacman, Scramble etc. Literature includes manual, Sharp software techniques, software secrets, excellent condition with original packing, £295 ono. Tel: 01-590 2880.

● Bargain, Sharp PC-1500 pocket micro + plotter + 8k extra RAM + manuals + application tape + microl procos + extra paper, excellent condition, cost over £400, accept £330 ono. Tel: Rotherham (0709) 898312.

● Nascom2 32k, NASYS-3, Zeap, Graphics, Bits & PCS toolkit ROM, games, manuals. Professionally built, Kenilworth case. Must sell so no sensible offer refused. Will deliver East Anglia/London. Tel: 035387-724.

● Apple II Europlus 48k, TV modulator, disc drive, and controller Dos tool kit, + manuals £800. Tel: 051 734 2054 after six.

● Microtan 65, Tanex, Basic, XBug, 10k RAM, T.U.G, P.G.M., and toolkit. Full ASCII keyboard, hex keypad, PSU, Rack mounted, some software T.U.G, newsletters, all manuals £250 ono. Tel: 0908 315418.

● MZ-80K complete system, I/O box, dual disc drives, P.3 printer, X/Tal card, CP/M modified, F.Dos, Double Precision Basic, Forth, workshop manuals, leads + lots of extras £999 ono. Tel: Southampton 774384.

● MZ-80K, A, Crazy Kong Game, 48k, pure M/C supersound supergraphics, the best M/C game you have ever seen £10. Joerg Lorenz Richardstr 88 1000 Berlin 44, West Germany.

● Apple II + disc drive and controller monitor, Seikosha GP100A and interface as new, boxed, with manuals, disks, etc £800 ono. Tel: Godalming (04868) 7794.

● Sorcerer 56k + Basic ROM Pak w processor, several games and leads, only £375. Contact Barry, 01-455 0310 work, 01-441 5866 home.

● Apple II+ 48k, disk drive, Silentype printer, language card, 12in Hitachi monitor, Dos toolkit, Visicalc, E-Z draw, games, etc £1,300 ono. Tel: Tadworth 2746.

● Apple II software for sale or exchange, Visidex, Apple Pascal, Apple Writer, Apple Plot, Apple Post, Graphics and games. Wanted Logo, Mountain Music Cards, games, etc. Tel: 021-744 3355.

● Sharp MZ-80K computer. As new, 4 MHX upgrade, reset switch, with Basic, Pascal, Forth, Fortran, Disassembler and hundreds of games, along with Sharp literature, books, etc. Bargain at £390. Tel: 07982 2596.

● Nascom 2 48k G802 graphics, Basic Zeap, homemade case, Ferguson cassette player, many tapes, 14in Sanyo TV modified for video. Owner going abroad. First offer over £500. Tel: Reading (0734) 476035.

● Genie I. One year old, as new. Including £200 software £270. Tel: 067072 646 after 4pm.

● TRS80 16k L2 complete with tape recorder, green screen, CRT, leads, manuals, + Level III Basic Enhancement and Flight Simulator tapes £250. Goodwin, Westerham (51) 63651 after 18.00 hrs (Kent).

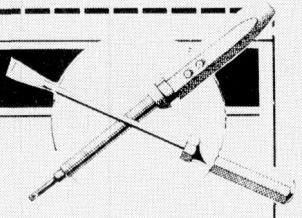
● ZX Spectrum 48k, boxed, as nmew, C/W leads, manuals, etc. £70 worth of software inc. many games + many magazines. Buyer collects. £120 ono. Tel: Brighton (0273) 34158 eves — Ray.

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 a flat fee of £2.50. Make cheques or POs payable to Personal Computer World. Ads accepted from private readers only. 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, 62 Oxford Street, London W1A 2HG.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

ACC NEWS



Rupert Steele presents his monthly round Amateur Computer Clubs.

The first thing is to note a change of address. All enquiries concerning ACC News should now be sent to my new address: Rupert Steele, 17 Lawrie Park Crescent, London SE26 6HH, tel: 01-778 6824.

To start off: Prestel and Club Spot 800. A major new development on Prestel, BT's telephone viewdata service, is Micronet 800. This service enables micro owners to get on to the Prestel system at a very low price and find, in addition to the normal Prestel services, all sorts of information about their micro, not to mention programs to run on it.

The idea is that, for a fee of roughly £50, you can join Micronet; when you do this, you receive an adaptor to allow your micro to speak to the Prestel system. In addition, there is a subscription of £1 per week, which ensures that you remain a member of the Micronet 'Closed User Group' (CUG). Members of Micronet can access a large amount of software, much of which is free, for their machine. They can read the program from the Prestel system, just as if it was typed in at the keyboard. An additional facility on Micronet is the Club Spot 800. This area contains information about local and national clubs and user groups, and acts as the national information area about the computer club movement.

Club Spot 800 is administered by the ACC on behalf of the amateur computing movement via a special committee, including elected representatives of the various clubs and user groups. Any club can edit its own material on Club Spot, and anybody interested in so doing should contact me, and I'll pass your details on to the database managers. To see Club Spot, go to Page 8008 on Prestel by keying *8008*. If you want information on joining Micronet contact them at Bushfield House, Orton Centre, Peterborough, PE2 0UW.

Club news

My pleas for computer clubs in the Birmingham area to come forth and identify themselves seems to be having some effect. Jo Gedrych writes from 4 Crackley Hill, Kenilworth CV8

ACC NEWS

2FP, with news of a new computer club in Kenilworth. Apparently the nucleus of the club is a group of scouts, so if you're about in the Kenilworth area and want to join what sounds like an extremely interesting club, then drop Jo a line.

OPeCC (that's Oxford Personal Computer Club) is having its AGM on 21 September in the Old Fire Station, Oxford at 7.30pm. There will be a social afterwards, with cheese and wine, so if you want to blow your mind as well as your PROMs, then this is the place to be.

I have had another communication from my friend Mr S Ericsson Zenith, in which he describes the progress of the Penwith (*not* Penrith—it's several hundred miles away) Area Independent Computer Club—PAICC (pronounced 'pace'). Membership of the ACC is available through PAICC, by paying just £2 on top of your PAICC subscriptioin. It seems to be doing lots of exciting things, so if you're in the Penzance area and interested in micros, contact Steven Ericsson Zenith, 'Dragon Gate', 77 St John's Street, Hayle, Cornwall. Oh yes, this club is actually founded on democratic principles!

Not a million miles away, a group of 6809 hackers has set up its group in Launceston. It's aiming for a bi-monthly newsletter with a subscription of about a fiver; it will contain lots of machine code software and tuition, hardware tips and projects, letters and ads. Write to Mr W Gibbons, Clarence Lodge, Hurdon Road, Launceston, Cornwall PL15 9DB. If this newsletter gets off the ground, we could give you some pages in ACCumulator to repeat it for a wider audience.

Which brings me on to a general point, that the ACC would be very glad to make parts of ACCumulator available to groups with something interesting to say (like the one mentioned above). Final editorial control would be with the ACC's newsletter editor, but it's unlikely that we'd make many changes, particularly if the material could come in camera-ready.

Shows

The next *PCW* show is coming soon (28 September to 2 October). If you want to get your club space there, then now is the time to act. Write to David Annal, 142 Windermere Road, London SW16 5HE for more information. If you can't manage to have a stand for your club we can distribute your leaflets from the ACC stand (A5 size if possible) and (space permitting) display a poster up to A4 size on a notice board.

There is going to be a computer fair at Keele University, Stoke on Trent, on Thursday 6 to Saturday 8 October this year. It's actually going to be held in the Sports Centre on the Keele campus, with hours: Thursday 6 October—2pm to 6pm; Friday 7 October—10am to 6pm; Saturday 8 October—10am to 5pm.

Anyway, I hope to see you there. If your club is interested in coming, please have a chat with David Annal (address above); he will be able to let you know how to get space. If you want to contact the organisers directly, write to Keele Computer Fair, Dept of Adult Education, Keele University, Staffs ST5 5BG.

The ACC is coming round to AGM time once again, so if you're an ACC member, put your mind to the exciting business that we could discuss there in mid October. Any committee nominations or agenda items to David Annal please.

Closed computer clubs

A number of computer clubs have sprung up with restricted membership, normally to members of some organisation and its guests. Many of these are concerned with places of work. Since the appeal is rather narrower than local clubs, I am listing contact details rather than describing them in full.

Home Office Amateur Computing Club, contact: L A King, Home Office Forensic Science Laboratory, Sandbeck Way, Audby Lane, Wetherby, W Yorks LS22 4DN.

Osnabruck Army base/school—VIC 20, BBC Model B at present, contact: Mr P Pascoe, Wellington School, Osnabruck, BFPO 36.

RAF Episkopi—ZX80/81, Spectrum, BBC Model B, Apple, UK101 and more, contact: D Softley, 12SU, RXERS, RAF Episkopi, BFPO 53.

RAF Kinloss Komputer Klub ('3K Store'), contact: Steve Barthorpe, 18 Trenchard Crescent, Kinloss, Forres, Moray IV36 0UP. Steve says that he'll consider helping start a town club too, if there is the interest, so start writing if you live around Kinloss.

Bicester Garrison Computer Club, contact: Pat Chandler, 19 Wellington Close, Bicester, Oxon OX6 7TQ.

Motherwell College Computer Club, contact: Nirmal Singh, Motherwell College, Dept of Elec Eng, Dazell Drive, Motherwell, Strathclyde ML2 1DD.

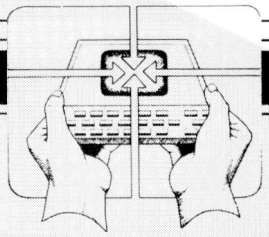
Hawker Siddley, contact: R W Wrattall, 6 Naseby Drive, Loughborough LE11 0NU. This may not be restricted entirely to Hawker Siddley employees: if you're interested in a Loughborough club, why not write in anyway?

St Thomas' Hospital Microcomputer Club, contact: Sebastian Till, Dept of Medicine, St. Thomas' Hospital, Lambeth Palace Road, London SE1.

Remember

To enquire about the ACC, or any of the points raised in this column, write to: Rupert Steele, 17 Lawrie Park Crescent, London SE26 6HH or tel: 01-778 6824.

CTUK! NEWS



Maggie Burton brings you all the latest CTUK! news.

Sadly, CTUK! News is a little shorter than last month. Still, we all know where the news comes from . . .

Anyway, we'll start with an apology, which seems as good a thing to start with as any. Roger Shears of CTUK! Southampton must be pretty fed up with having his address printed wrongly by now. It is 181 Woodmill Lane, Bitterne Park—not 18 as has appeared in CTUK! Contacts for some time now. Sorry, Roger—we've got it right at last.

Meanwhile, across the Atlantic in the USA, a company called the Yes! Bookshop has brought out a catalogue of computer books. It contains over 50 pages of book reviews arranged by topic, and claims to have reviewed over 800 books in total. It looks good and if you are choosing computer books, either for your home or possibly for CTUK! or club use it could well be a good buy. To get hold of a copy, just send $2 (and your address) to:
The Yes! Bookshop, 1035 31st Street NW, Washington DC 2007, USA.

Lastly, but not leastly, we've been in touch with a certain TV company (no, we're not saying which one) about making a programme in which it is interested in featuring a Computer Town. If you are setting up a Town, or have established one and would like

Computer Town UK! is a rapidly expanding network of computer literacy centres where members of the public are given free access to all sorts of computer equipment. This is courtesy of those willing to offer time/resources. You can find a Computer Town anywhere – they're often in libraries or schools. The aim is to make micros enjoyable and non-threatening, so axe-grinding of any sort is banned. Guidelines are available for those interested in starting up their own 'Towns. Write to: CTUK!, PCW, 62 Oxford Street, London W1A 2HG. Remember to enclose an A4 SAE for your reply. Please don't ring PCW for information as CTUK! is entirely a spare time activity.

CTUK! NEWS

to contribute to putting together a CTUK! item for TV, please write to: CTUK! TV, *PCW*, VNU Business Publications, Evelyn House, 62 Oxford Street, London W1. One of the aims of the item will be to attract both attendance and volunteers to Computer Town, so we will need to know as much as possible about CTUK! activities, ideas and attendances—ages, types of people and the like. Look forward to hearing from you.

Tony Cartmell
54 Foregate Street
Worcester WR1 1DX

Ted Ellerton
25 Beachdale
Winchmore Hill
London N21

Bill Gibbings
2 Longholme Road
Retford
Notts DN22 6TU

Peter J Kiff
2 Ranelagh Grove
St Peter's in Thanet
Broadstairs
Kent CT10 2TE

John Stephen Bone
2 Claremont Place
Gateshead
Tyne & Wear NE8 1TL

Andrew Stoneman
135 Birchdale Avenue
Newcastle-Upon-Tyne
Tyne & Wear

Derek Knight or Bob Carter
Rayners Lane Library
Imperial Drive
Rayners Lane
Middx

Christopher Bates
Ashford Main Library
Church Road
Ashford
Kent

Paul Maddison
Gardenways
Chilworth Towers
Chilworth
Southampton SO1 7JH

Chris Cooper
110 Church Road
Hanwell
London W7

Brian Taylor
Tonbridge Area Library
Avebury Avenue
Tonbridge
Kent

Ray Skinner
62 Central Avenue
Billingham
Cleveland TS23 1LN

E N Ryan
15 Queens Square
Eastwood
Nottingham NG16 3BJ

Philip Joy
130 Rush Green Road
Romford
Essex

Derrick Daines
18 Cuttings Avenue
Sutton-in-Ashfield
Notts

Patrick Colley
52 Queensway
Caversham Park Village
Reading
Berks RG4 0SJ

J M A Kilburn (Headmaster)
Shawfield Norden
Community Middle School
Shawfield Lane
Norden
Rochdale OL12 7QR

Vernon Quaintance
50 Beatrice Avenue
Norbury
London SW16 4UN

BJ Candy
9 Oakwood Drive
Gloucester GL3 3JF

Roger Shears
181 Woodmill Lane
Bitterne park
Southampton SO2 4PY

Chris Woodford
31 Hopley Road
Anslow
Burton-on-Trent
Staffordshire

Mike Perry, Steve Collas or
Dave Lee
The Library
Ealing Road
Wembley
Middx HA0 4BR

Peter Herring
Ordnance Road Library
Ordnance Road
Enfield
Middx

Lyn Antill
1 Defoe House
Barbican
London EC2

Peter Jarvis
c/o Health Dept
Corporation of London
Guildhall
London EC2

Vernon Gifford
111 Selhurst Road
Croydon
London SE25 6LH

Peter Stone or
Alan Strangman
Computing and Maths Dept
The Polytechnic
Wulfruna Street
Wolverhampton WV1 1LY

J G Batch
Central Library
Clapham Road
Lowestoft NR32 1DR

John Byfield
Moonrakers
The Rutts
Bushey Heath
Herts WD2 1LH

Robin Bradbeer
Polytechnic of North London
Holloway Road
London N7

Derek Moody
2 Victoria Terrace
Dorchester
Dorset DT1 1LS

Pam Pollicott
South Ruislip Library
Victoria Road
South Ruislip
Middx

Rex Shipton
17 Woodlands Avenue
Eastcote
Middx

Susan Kelly
Head of Reference Services
PO Box 4
Civic Centre
Harrow
Middx

Andrew Holyer
10 Masons Road
Mannings Heath
Horsham
Sussex RH13 6JP

R L Saunders
14 St Nicholas Mount
Hemel Hempstead
Herts

Brigitte Gordon
18 Purbright Crescent
New Addington
Croydon CR0 0RT

Richard Powell
22 Downham Court
South Shields
Tyne & Wear

Peter Earthy
46 High Street
Church Stretton
Shropshire SY6 6BX

Alan Sutcliffe
4 Binfield Road
Wokingham
Berks RG11 1SL

Alan Porten
14 Foxmede
Rivenhall End
Witham
Essex

David Sharp
5 Bridgenhall Road
Enfield
Middx

Keith Taylor
Carter Hydraulic Works
Thornbury
Bradford BD3 8HG

Alan Hooley
21 Brammay Drive
Tottington
Bury BL8 3HS

NETWORK NEWS

Peter Tootill keeps us updated on telephone networking in the UK.

There has been a considerable growth of interest in the area of 'telephone networking' recently. The advent of cheap modem kits from Maplin and Radio and Electronics World has contributed to this, as has the explosive growth in the

NETWORK NEWS

number of home micro users. Incidentally, I have had several Maplin modem users on my own bulletin board (Liverpool Mailbox) and all have praised the modem. It is, apparently, a very good quality design, and also fairly straightforward to build. You can build it without an oscilloscope even though the instructions say you need one. Obviously for optimum performance an oscilloscope is required.

There are several new bulletin boards running in the UK, and more are proposed (see below). Details of others will be given as and when they get off the ground. Most operators are finding an increasing number of callers as well, which is encouraging. The more callers a system has the more messages there will be, and the more interesting it becomes, which in turn encourages more callers . . . Always try to leave some sort of message when you call a system — maybe about a program you can recommend, a hint about your own computer, or even a question. I find the last get answered quite quickly, unless you want to know something very unusual!

I will conclude with a few items of news:—

1 **Bettisfield Remote CP/M System** has closed down until September.

2. **AFPAS:** The majority of the operators of hobby microcomputer bulletin boards have formed the 'Association of Free Public Access Systems'. The aims are to promote the whole area of hobbyist telephone networking. Details from The Secretary, Fred Brown, 421 Endike Lane, Hull HU6 8AG(*sae* please).

3 **Liverpool Mailbox** now has a new number — (051) 428 8924 — and is running new (TBBS) software. This software provides for much increased facilities which are being added all the time.

4 **Prestel** has introduced a 300 baud service, which is accessible to terminals and microcomputers with a V.21 modem or acoustic coupler. At £5 a quarter and no time charges at off peak periods (you just pay for the phone calls) for domestic users, this is a very interesting development. Details from Prestel on Freefone 2296.

5 **Systems outside the UK:** I plan to cover these in more detail in a future column; in the meantime most of the Swedish ones previously listed are still going, if you speak Swedish! (You can get some help with that problem from CBBS-NE, see below.)

6 **CBBS-NE** is now up on two numbers, one uses US standard frequencies overnight. (See table for details.)

7 **Ring Back Systems** are becoming more common. You just dial the number, let the phone ring once, replace the receiver and call again. The computer is programmed to accept the second call. This is a very common method of operation in North America; it avoids tying up the phone, permitting voice calls as well as data. Incidentally, there are a very large number of bulletin boards running in North America where the idea of telephone networking caught on a few years ago in a big way. The main problem for UK callers (apart from the cost of calls!) is that US and European frequencies differ, so that you need a different modem to communicate with them.

TBBS, London . . . Tel: (01) 348 6518* **System Operator:** John Newgas. Hours: Mon-Fri 10pm-1am; weekends 2pm-1am.

CBBS North East . . . **System Operators:** Trevor Smith & Malcolm Piper. Hours: tel: (0207) 43555, 2.30pm-9am daily; tel: (0207) 32447, 7pm-midnight CCITT standards; midnight-8.30am Bell 103 (US) standards.

Mailbox-83, Stourport . . . Tel: (038482) 7868* **System Operator:** Jim Roden. Hours: 9am-midnight daily.

Forum-80 Hull . . . (Forum-80 HQ) Tel: (0482) 859169. **System Operator:** Fred Brown. International electronic mail, library for up/down loading software.
Forum-80 Users Group, Pet Users section shopping list system. Hours: 7 days a week midnight to 8am; Tues/Thurs 7-10pm; Sat/Sun 1-10pm; nights, midnight-8am, US (Bell 103) standards.

Forum-80 London . . . Tel: (01) 902 2546. **System Operator:** Victor Salel. Electric mail, library for downloading. Hours: Tues/Fri/Sun 7-11pm.

Forum-80 Holland . . . Tel: 01 313 512 533. **System Operator:** Nico Karssemeyer. Facilities: electronic mail, program up/downloading, shopping list. Hours: Tues-Sat 6pm-7am; continuous from 6pm Sat-7am Tues.

CBBS London . . . Tel: (01) 399 2136. **System Operator:** Peter Goldman. Facilities: electronic mail, program downloading. Hours: Sun 5-10pm.

Forum-80 Milton . . . (TRS-80 Users Group 80-Nett) Tel: (0908) 613004. **System Operators:** Leon Heller and Brian Pain. Electronic mail, library, newsletter, TRS-80 information system. Hours: 7 days a week 7-10pm.

Mailbox-80 Liverpool . . . Tel: (051) 428 8924. **System Operator:** Peter Tootill. Electronic mail, downloading TRS-80 information. Hours: 24 hours daily.

ACC . . . members bulletin board. Tel: (0908) 44262. **System Operator:** Peter Whittle.

ABC-80 . . . Stockholm (Sweden). Tel: 010-468 190522.

University Research Computer . . . Sweden. Tel: 010-468 23660. Guests use password '66,66' for access.

Elfa . . . Sweden. Tel: 010-468 7300 706.

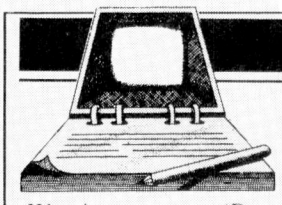
Tree Tradet . . . Sweden. Tel: 010-468 190522.

Rewtel . . . (Radio & Electronics World's bulletin board). Tel: (0277) 232628. 24 hour service 7 days a week. Packed with useful and interesting information, etc. Subscription fee £10 pa. Non-subscribers may have eight mins free. Hardware required: 300 baud full duplex. Standard page: 64 characters by 16 inches.

The above information is correct and current, to the best of my knowledge, but I would be pleased to receive corrections and updates, either via Liverpool Mailbox, or to 7 Stockville Road, Liverpool L18 3EJ.

*Ring back system — dial the number, let phone ring once and then ring back.

DIARY DATA



Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

Warrington	(Parr Hall) Business to Business Exbn. Contact: Peter Street, (061) 833 0812	16-18 August
London	(Cunard International Hotel) Acorn User Exbn. Contact: Computer Market Place Ltd, (01) 930 1612	25-28 August
Leeds	(Draganora Hotel) Computer Open Day Exbn. Contact: Crouchmead Communications Ltd, (01) 778 1102	1 Sept
Amsterdam	(Kantoorinnovaitie) Personal Computers & Office Automation Systems Exbn. Contact: Ral Gebouw BV, Europaplein 2,1078 GZ, Amsterdam.	5-8 Sept
Edinburgh	(Ingliston Showground) S of Scotland Business Exbn. Contact: Chiltern Exbns, (0462) 59909	13-16 Sept
London	(Barbican) Personal Computer World Show. Contact: Montbuild Ltd, (01) 486 1951	29 Sept-22 Oct

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MICROMART

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- Databases on Microcomputers
- Introduction to **dBASE II**
- Hands on use of **dBASE II**
- System design for **dBASE II**
- Programming in **dBASE II**
- Practical work on **dBASE II**
- Programming aids & style

Numers are **strictly limited** to not more than 20 delegates. Registration is at 0900-0915, lunch 1300-1415, and conclusion at 1800. Several micros are used for hands on work including: Osborne, Sirius, Televideo, Galaxy, etc. Four lecturers are present so as to ensure that every delegate receives individual help in the practical sessions.

The next course is on Saturday **JUNE 4th**. Currently planned dates are for the following SATURDAYS at a West London hotel:

June	4, 18
July	2, 16, 30
September	10, 24
October	15, 29

Cost: £90 + VAT payable in advance but with scaled refunds if cancellation within specified notice periods. Cost includes course material, meals and refreshments, and a copy of Arthur Green's book: "dBASE II User's Guide". Payment by Cheque, PO, Access or VISA. Detailed explanatory leaflet available with fuller description. To make a booking or to obtain further details, telephone or write to: Steve Conlon at:

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During the past month, I've come across three submissions, each by a different author and all based on the same idea. Since each program is for a different machine and all are reasonably short, I decided to include all three in this issue (see below). The first is for the VIC-20, the second for the MZ-80K and the third for the 16k ZX81. With three versions to choose from, it should be easy to adapt at least one of them to just about any machine around (providing it supports Basic, of course).

VIC-20 Snake line

by Michael Charlton

The object of Snake line is to guide a snake around the screen, eating flashing numbers as you go. For each number you 'eat', you gain a corresponding number of points. Each time you crash, however, you lose ten points. You can crash into the edge of the screen, one of the various obstacles scattered around or even your own (that is to say, the snake's) tail. There are five skill levels ranging, in the words of our referee, from 'very hard to damn nigh impossible'. I found the keys used to control the snake's movement (w, a, d & x for up, left, right & down respectively) inconvenient, but these could easily be changed by editing lines 140-170 and 2110-2140.

```
0 goto2000
1 dimlo(25):P=7913:sc=0:co=0:c=1:Poke36878,15
5 d=1:t=59:gosub10:Print"■■Score 0   time 60":goto50
10 Print"■";:forq=1tosk*300:a=7680+rnd(1)*500:Pokea,170:Pokea+30720,rnd(1)*8:nex
t
11 forq=7680to7701:Poke9,160:Poke9+30720,0:next
12 Print"■■Score"sc
20 forq=1to21:Pqint"■ ■■■■■■■■■■■■■■■■■■■■■■ ";:next
21 Print"■                              ";:co=0
23 PokeS185,160:Poke38905,0
25 forq=1to25:readlo(q):Pokelo(q),160:Pokelo(q)+30720,(60-t)/7.5:next:restore:lo
(1)=P
27 Poke7954,32
35 forz=lo(25)+1tolo(25)+8:Pokez,32:next:Poke7680+23,32
40 return
50 Poke36879,141:s1=36876
```


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PROGRAMS

```
65 ti$="000000"
100 rv=(60-t)/7.5
102 PokeP,160
103 PokeP+30720,rv
104 t=60-val(ti$)
105 Print"■";tab(9)"Time "t;:ift<10thenPrint"■ ";
106 ift<0then1500
107 ifPeek(n)<>160thenPoken+30720,rnd(1)*8
109 gosub140
110 P=P+d:c=c+1:ifP=nandPeek(n)<>32then500
115 ifc=26thenc=1
120 ifPeek(P)>128then1000
130 Pokelo(c),32:lo(c)=P
135 ifco=0andrnd(1)>.35thenn=0:goto210
136 ifco=1andrnd(1)>.99-skthenPokeP+30720,rv:goto300
137 goto100
140 geta$:ifa$="w"anddd<>22thend=-22
150 ifa$="a"anddd<>1thend=-1
160 ifa$="d"anddd=-1thend=1
170 ifa$="x"anddd=-22thend=22
180 return
210 n=7680+int(rnd(1)*500):ifPeek(n)<>32then210
215 ifn=pthen210
220 m=int(rnd(1)*8)+49:Poken,m+128:Poken+30720,4
230 t$=ti$:forq=15to1steP-1:Poke36877,255-10*q:Poke36877,0:next
270 ti$=t$:co=1:goto100
300 Poken,32:n=0:co=0
310 forq=230to200steP-1:Pokes1,q:next:Pokes1,0:goto100
500 v=Peek(P)-176:PokeP+30720,1:ifc=26thenc=1
510 forq=1tov:sc=sc+1:Print"■■Score"sc:PokeP,Peek(P)-1
520 fori=180to230:Pokes1,i:next:next:Pokes1,0
530 PokeP,160:PokeP+30720,0:Poken,32:n=7703:Pokelo(c),32:lo(c)=P:co=0:goto115
1000 s2=36878:ca=ca+1:f$=ti$
1010 Poke36877,128:forq=15to0steP-.1:Pokes2,q:next:Poke36877,0:Pokes2,15
1020 forP=1to25:lo(P)=0:next:c=1:co=0:P=7913:Poke198,0:ifsc<10thensc=0
1025 ifsc>9thensc=sc-10
1030 co=0:Poke36878,15:ti$=f$
1040 gosub10:d=1:P=7913:goto100
1500 ifsc>15+(1/sk)andf9=0thenf9=1:goto1600
1501 Print"■■■■■■■■■TIME UP■":Poke36879,127
1510 Print"■You scored"sc"Points"
1512 Print"■ On skill level"sk*50
1515 ifca=0thenPrint"■■You didn't crash!!":goto1530
1520 Print"■■And crashed"ca"time";:ifca>1thenPrint"s"
1530 Print
1540 ifsc>Peek(820+50*sk)thenPoke820+50*sk,sc:Print"■It Is The Best Score":goto1
560
1550 Print"■Best score still"Peek(820+sk*50):Print"■  on level"sk*50
1560 Print"■■■■■■■Type in your Skill":Poke198,0:clr
1565 Print"■■■■■■■■■(1 to 5)":Print"■■■■■■■Easy to Hard"
1570 geta$:ifa$<"1"ora$>"5"then1570
1580 sk=val(a$)/50:goto1
1600 forz=1to4:Print"■■■■■■■■■■■■■■■Extra Time":forx=1to750:next
1605 Print"■■■■■■■■■■■■■■■
```

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PROGRAMS

MZ-80K Trap

by Frank R Rooney

In Trap, both you and a computer-controlled snake slither happily around the screen. The first one to crash into either trail loses. The computer plays a pretty good game (I say this having been heavily defeated).

The keys used to control your movement are the same as in Snake line (x, a, d & w), but these make sense on the Sharp's keyboard. The screen presentation is neat and the program incorporates some nice sound effects in lines 590 onwards.

```
 10 REM ┌──────────────────┐"
 15 REM │  TRAP ◆ MZ-80K   │"
 20 REM │ F.R.Rooney 1982  │"
 25 REM └──────────────────┘
 30 GOTO100
 35 X=T:Y=V:D=K:GOTO60
 40 X=W:Y=Z:D=M:GOTO60
 45 X=W:Y=Z:D=H:GOTO60
 50 X=W+X(M):Y=Z+Y(M):D=M:GOTO60
 55 X=W+X(H):Y=Z+Y(H):D=H:GOTO60
 60 X=X+X(D):Y=Y+Y(D)
 65 IFX<0THENX=MX
 70 IFX>MXTHENX=0
 75 IFY<0THENY=MY
 80 IFY>MYTHENY=0
 85 A=S+X+F*Y
 90 RETURN
 95 PRINT"@";P$;P$;P$;P$;:RETURN
100 TEMPO7:DIM X(4),Y(4),C(4),D(11)
105 FORI=1TO4:READ X(I),Y(I),C(I):NEXT
110 FORI=0TO11:READD(I):NEXT
114 REM [60 DOTS]
115 P$="..............................................
    .........."
120 P$=P$+P$:P$=P$+P$
125 E=208:J=67:F=40:P=46:MX=39:MY=23:N=0
130 US=0:CS=0:L=2:R=3:U=4:S=53248
135 GOSUB510:PRINT"@":USR(62)
140 POKE4466,10:PRINTTAB(11);"Press <S> to start"
145 GETB$:IFB$=""THEN145
150 IFB$="S"THEN160
155 GOTO145
160 GOSUB95:TT=RND(1)
165 K=3:M=2:C=0:T=10:V=7:W=29:Z=17
170 O=S+T+F*V:Q=S+W+F*Z
175 GETC$
180 IFC$=""THEN215
185 IFC$="X"THEND=1:GOTO210
190 IFC$="A"THEND=2:GOTO210
195 IFC$="D"THEND=3:GOTO210
200 IFC$="W"THEND=4:GOTO210
205 GOTO175
210 K=D
215 GOSUB35
220 IFPEEK(A)<>PTHENC=C+1
225 IFN=1THENMUSIC"_CO"
230 POKEO,E:POKEA,C(K)
235 O=A:T=X:V=Y
240 GOSUB50:B=A:GOSUB40
245 IF(PEEK(B)=P)*(PEEK(A)=P)THENRN=RND(1):IFRN<.96THEN315
250 TT=INT(L*RN)+R*(M-1)
255 H=D(TT):G=D(TT+1)
260 GOSUB55:B=A:GOSUB45
265 IF(PEEK(B)=P)*(PEEK(A)=P)THEN310
270 IFH<>GTHENH=G:GOTO260
275 GOSUB40
280 IFPEEK(A)=PTHEN315
285 TT=INT(L*RND(1))+R*(M-1)
290 H=D(TT):G=D(TT+1)
295 GOSUB45
300 IFPEEK(A)=PTHEN310
305 IFH<>GTHENH=G:GOTO295
310 M=H
315 IFPEEK(A)<>PTHENC=C+L
320 IFN=1THENMUSIC"-CO"
```


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PROGRAMS

```
325 POKE0,J:POKEA,C(M)
330 Q=A:W=X:Z=Y
335 IFC>0THEN345
340 GOTO175
345 PRINT"■";
350 IFC>1THEN365
355 CS=CS+1
360 GOSUB605:PRINT"Y O U";:GOTO395
365 IFC>LTHEN380
370 US=US+1
375 GOSUB590:PRINT"C O M P U T E R";:GOTO395
380 US=US+1:CS=CS+1
385 POKEA,109
390 GOSUB615:PRINT"B O T H";
395 PRINT"    C R A S H E D !"
400 PRINT"                ";"■■■■■■■■■■■■■■■■YOU=";US;
405 PRINT"  COMPUTER=";CS
410 GOTO140
415 DATA0,1,88,-1,0,69,1,0,90,0,-1,80
420 DATA3,2,3,4,1,4,4,1,4,2,3,2
425 PRINT"■";TAB(8);"I N S T R U C T I O N S"
430 PRINT;TAB(8);"----------------------"
435 PRINT"■■■■The object of the game is to trap the"
440 PRINT"■computer.  Your track-maker starts in"
445 PRINT"the upper left part of the screen."
450 PRINT"■■■■You control its motion with the keys ";
455 PRINT"'W','A','D' and 'X' in ";
460 PRINT"the directions   shown below."
465 PRINTTAB(19);"■■↑■■ I■■W■■■■■■■■←--A    D--→■■■■■■■■X■■ I■■↓"
470 PRINT"■■■■■■■■< Press any key to continue >"
475 GETD$:IFD$=""THEN475
480 PRINT"■■■■■■■■Press <Q> if you want a quiet game."
485 PRINT"■■Press <N> if you want a noisy game."
490 GETY$:IFY$=""THEN490
495 IFY$="Q"THENRETURN
500 IFY$="N"THENN=1:RETURN
505 GOTO490
510 PRINT"■■■"
515 PRINT"          ▗▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▄▖"
520 PRINT"          ▐                 ▌"
525 PRINT"          ▐ ▒▒▒ ▒▒▒▙ ▟▒▒▙ ▒▒▒▙ ▌"
530 PRINT"          ▐   ▒   ▒ ▒ ▒ ▒ ▒ ▒ ▌"
535 PRINT"          ▐   ▒   ▒▒▛ ▒ ▒ ▒▒▛ ▌"
540 PRINT"          ▐   ▒   ▒ ▙ ▒▒▒ ▒   ▌"
545 PRINT"          ▐   ▒   ▒ ▒ ▒ ▒ ▒   ▌"
550 PRINT"          ▐                 ▌"
555 PRINT"          ▝▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▀▘"
560 GOSUB615
565 PRINT"■■■■■■■■Do you want instructions ? (Y or N)"
570 GETA$:IFA$=""THEN570
575 IF A$="Y"THENGOSUB425:RETURN
580 IFA$="N"THENRETURN
585 GOTO570
589 REM [SOUND EFFECTS]
590 FORS1=1TO4:FORS2=1TO3:POKE4514,S1:FORS3=255TO0STEP-60
595 POKE4513,S3:USR(68)
600 NEXTS3:NEXTS2,S1:USR(71):RETURN
605 FORS1=17TO1STEP-2:POKE4514,S1:FORS2=0TO255STEP50
610 POKE4513,S2:USR(68):NEXTS2,S1:USR(71):RETURN
615 FORS1=6TO2STEP-1:POKE4514,S1:FORS2=0TO255STEPS1*2
620 POKE4513,S2:USR(68):NEXTS2,S1:USR(71):RETURN
```

ZX81 Surround

by Graham Stoneman

Instructions as for MZ-80K 'Trap', except that the keys controlling your snake's movements are 5, 6, 7 and 8 for left, down, up and right respectively. If you want to change these to more sensible keys, the lines to edit are 270-300 inclusive.

When you run the program, you will be asked how many games you wish to play. Since the program already asks you whether you want to play again after each game this seems mildly pointless. I'm inclined to delete lines 610 and 50-60 inclusive.

```
  1 REM 16K SURROUND
  5 DIM A(4)
 10 LET C=0
 15 LET S=0
 20 LET T=3
```


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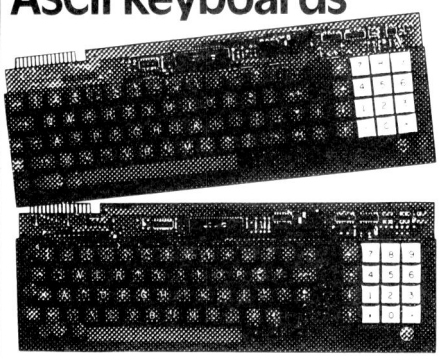

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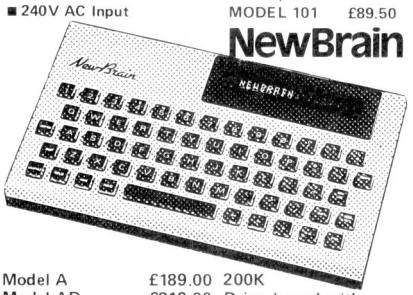

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PROGRAMS

```
 25 LET A=PEEK 16396+256*PEEK 16397
 30 LET A(1)=1
 35 LET A(2)=-1
 40 LET A(3)=33
 45 LET A(4)=-33
 50 PRINT "HOW MANY GAMES (1-10) ?"
 55 INPUT T
 60 IF T<1 OR T>10 THEN GOTO 55
 65 POKE 16418,0
 70 CLS
 80 LET P=517
 90 PRINT "YOU ";C;AT 0,9;"* SURROUND *    ME ";S
100 LET D=A(INT (RND*4)+1)
110 LET Y=1
120 LET X=306
130 FOR N=1 TO 23
140 PRINT "............................."
150 NEXT N
160 POKE A+X,128
170 POKE A+P,136
180 FOR N=1 TO 10
190 PRINT AT 6+N,31;"■"
200 NEXT N
210 FOR N=1 TO 10
220 FOR F=1 TO 20
230 NEXT F
240 PRINT AT 6+N,31;" "
250 NEXT N
260 LET D$=INKEY$
270 IF D$="5" THEN LET Y=-1
280 IF D$="6" THEN LET Y=33
290 IF D$="7" THEN LET Y=-33
300 IF D$="8" THEN LET Y=1
310 IF D$<>"" AND RND>.5 THEN LET D=-Y
320 LET X=X+Y
330 IF PEEK (A+X)<>27 THEN GOTO 600
340 POKE A+X,128
350 IF PEEK (A+(P+(3*D)))<>27 THEN GOTO 420
360 IF RND<.1 THEN LET D=A(INT (RND*4)+1)
370 LET P=P+D
380 IF PEEK (A+P)<>27 THEN GOTO 410
390 POKE A+P,136
400 GOTO 260
410 LET P=P-D
420 LET R=INT (RND*4)+1
430 IF PEEK (A+(P+A(R)))<>27 THEN GOTO 460
440 LET D=A(R)
450 GOTO 370
460 IF PEEK (A+(P+1))<>27 THEN GOTO 490
470 LET D=1
480 GOTO 370
490 IF PEEK (A+(P-1))<>27 THEN GOTO 520
500 LET D=-1
510 GOTO 370
520 IF PEEK (A+(P+33))<>27 THEN GOTO 550
530 LET D=33
540 GOTO 370
550 IF PEEK (A+(P-33))<>27 THEN GOTO 580
560 LET D=-33
```

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PROGRAMS

```
570 GOTO 370
580 PRINT AT 22,0;"YOU WIN"
585 LET C=C+1
590 GOTO 610
600 PRINT AT 22,0;"I WIN"
605 LET S=S+1
610 IF C+S=T THEN GOTO 640
615 PRINT AT 23,0;"ANOTHER GAME"
620 IF INKEY$<>"Y" AND INKEY$<>"N" THEN GOTO 620
630 IF INKEY$="Y" THEN GOTO 70
640 FOR W=0 TO 760 STEP 33
650 POKE A+W,118
660 NEXT W
670 CLS
680 PRINT "OUT OF ";C+S;" GAMES, I WON ";S;" AND YOU WON ";C
690 POKE 16418,2
700 STOP
```

Program of the Month

MZ-80K Composer

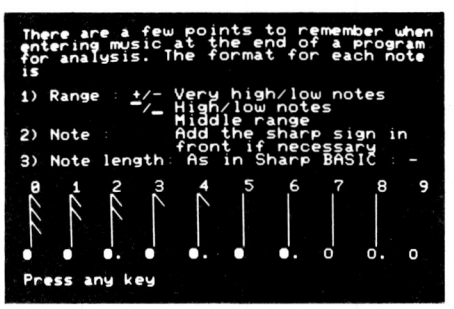
by Richard Lee

'Composer' is a program for budding Beethovens. Using the Sharp's music facility, it allows you to compose, save and play masterpieces of music on your MZ-80K.

The standard Sharp Basic offers three octaves. This is really only of use for the simplest of melodies, so Richard Lee has added two further octaves in his program. Melodies are initially entered into the program as data statements in line 2000 onwards. Each note to be played is represented by between two and four characters; the first two being optional. The first character specifies the octave (middle by default); the second indicates whether the note is true or sharp (true by default); the third specifies the actual note (a-g); the fourth gives the note length as per standard Sharp Basic (0-9). When you've entered the complete melody, count the number of notes and enter this figure as the first data statement. All this is explained within the program and some examples are given immediately following the listing below.

Once you've finished entering data, run the program and select the 'R)ead data from program' option. You are now free to P)lay your program and to S)ave it to tape by selecting the appropriate menu option. On a 48k machine, approximately 12k is available for data. Melodies are saved to and loaded from cassette as named data files.

A useful addition to the program would be an editor to allow you to enter and edit melodies from within the program. I suspect that this was not included for reasons of space, but someone may like to tackle it. The sample melodies supplied with the listing are quite remarkable: try *The Entertainer* for an idea of the program's capabilities!




```
100 REM ########################
110 REM #  COMPUTER COMPOSER   #
120 REM # for the SHARP MZ-80K #
130 REM #                     #
140 REM #    By Richard Lee   #
150 REM #       May 1982      #
160 REM ########################
```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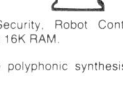

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PROGRAMS

```
170 REM
180 CLR:RESTORE
190 P=17828:L=40960:N=60:G=2483
200 DIMA$(N),A(N),B(N),N(9)
210 LIMITL
220 REM
230 REM ♦    DATA FOR FREQUENCIES
240 REM
250 REM + U.HIGH RANGE
260 DATA  3,187,+C, 3,133,+#C
270 DATA  3, 83,+D, 3, 35,+#D
280 DATA  2,245,+E
290 DATA  2,203,+F, 2,163,+#F
300 DATA  2,126,+G, 2, 90,+#G
310 DATA  2, 56,+A, 2, 24,+#A
320 DATA  1,250,+B
330 REM - HIGH RANGE
340 DATA  7,119,-C, 7, 12,-#C
350 DATA  6,167,-D, 6, 71,-#D
360 DATA  5,236,-E
370 DATA  5,151,-F, 5, 72,-#F
380 DATA  4,251,-G, 4,179,-#G
390 DATA  4,113,-A, 4, 49,-#A
400 DATA  3,244,-B
410 REM MIDDLE RANGE
420 DATA 14,238, C,14, 24, #C
430 DATA 13, 78, D,12,142, #D
440 DATA 11,218, E
450 DATA 11, 48, F,10,144, #F
460 DATA  9,248, G, 9,104, #G
470 DATA  8,226, A, 8, 98, #A
480 DATA  7,234, B
490 REM _ LOW RANGE
500 DATA  29,220,_C,28, 48,_#C
510 DATA  26,156,_D,25, 28,_#D
520 DATA  23,180,_E
530 DATA  22, 96,_F,21, 32,_#F
540 DATA  19,240,_G,18,208,_#G
550 DATA  17,196,_A,16,196,_#A
560 DATA  15,212,_B
570 REM - VERY LOW RANGE
580 DATA  59,185,-C,56, 96,-#C
590 DATA  53, 57,-D,50, 56,-#D
600 DATA  47,105,-E
610 DATA  44,192,-F,42, 64,-#F
620 DATA  39,225,-G,37,161,-#G
630 DATA  35,137,-A,33,137,-#A
640 DATA  31,169,-B
650 FORI=1TON:READA(I),B(I),A$(I):NEXTI
660 REM
670 REM ♦    DATA FOR NOTE LENGTHS    ♦
680 REM
690 DATA 0,2,3,4,6,8,12,16,24,32
700 FORI=0TO9:READN(I):NEXTI
710 REM
720 REM ♦           TITLE             ♦
730 REM
740 PRINT"■■■    ================================
750 PRINT"    SHARP MZ-80K  5 OCTAVE COMPOSER"
760 PRINT"    ================================"
770 PRINT"■■Commands:":PRINT"R = Read data from program
780 PRINT"L = Load data from tape"
790 PRINT"S = Save data on tape"
800 PRINT"P = Play music"
810 PRINT"I = Instructions"
820 PRINT"E = End program■"
830 POKEP,0:PRINT">";:USR(G):GETA$:PRINTCHR$(PEEK(P)):IFA$="R"GOTO910
840 IFA$="L"GOTO1090
850 IFA$="S"GOTO1180
860 IFA$="P"GOTO1010
870 IFA$="I"GOTO1260
880 IFA$="E"THENLIMITMAX:END
890 GOTO770
900 REM
910 REM ♦   READ AND ANALYSE DATA    ♦
920 REM
930 PRINT"READING AND ANALYSING DATA"
940 X=L:READQ:FORI=1TOQ:READJ$:POKEX+2,N(VAL(RIGHT$(J$,1)))
950 N$=LEFT$(J$,LEN(J$)-1):FORJ=1TON:IFN$=A$(J)GOTO970
960 NEXTJ:POKEX,0:POKEX+1,0:GOTO980
970 POKEX,A(J):POKEX+1,B(J)
980 X=X+3:NEXTI
990 GOTO830
1000 REM
1010 REM ♦         PLAY MUSIC          ♦
1020 REM
1030 INPUT"ENTER SPEED (1-10) ";SP:IF(SP(1)+(SP)10)GOTO1030
1040 X=L:A=4514:B=4513:SP=SP*5
1050 FORI=1TOQ:POKEA,PEEK(X):POKEB,PEEK(X+1):USR(68):FORJ=1TOPEEK(X+2)*SP
1060 NEXTJ:X=X+3:NEXTI
1070 USR(71):GOTO830
1080 REM
1090 REM ♦          LOAD               ♦
1100 REM
```


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PROGRAMS

```
1110 PRINT"ENTER FILE NAME ('/' IF NOT KNOWN)":INPUTF$:IFF$="/"GOTO1130
1120 ROPENF$:GOTO1140
1130 ROPEN
1140 X=L:INPUT/TQ:FORI=1TOQ*3:INPUT/TA:POKEX,A:X=X+1:NEXTI
1150 CLOSE
1160 GOTO830
1170 REM
1180 REM ♦            SAVE            ♦
1190 REM
1200 PRINT"ENTER FILE NAME ":INPUTF$
1210 WOPENF$
1220 X=L:PRINT/TQ:FORI=1TOQ*3:PRINT/TPEEK(X):X=X+1:NEXTI
1230 CLOSE
1240 GOTO830
1250 REM
1260 REM ♦       INSTRUCTIONS         ♦
1270 REM
1280 PRINT"This composer enables you to write music";
1290 PRINT"over a five octave range. Standard Sharp";
1300 PRINT"BASIC provides only three. So now there"
1310 PRINT"is a much greater range melodies and
1320 PRINT"tunes playable. The rest of the instr-"
1330 PRINT"uctions explain each of the commands and";
1340 PRINT"show how to enter notes                Press any key":USR(G)
1350 PRINT"The first option, R reads notes using
1360 PRINT"ordinary READ and DATA facilities. It
1370 PRINT"analyses them, storing them as numbers
1380 PRINT"in the memory. Since this program does
1390 PRINT"not store this data with arrays, there
1400 PRINT"is no 256 character limit - keep on "
1410 PRINT"entering notes until you find that the
1420 PRINT"machine runs out of memory."
1430 PRINT"The first piece of data is a number with";
1440 PRINT"the number of notes to read."
1450 PRINT"L is for loading data from tape which
1460 PRINT"has been saved using the S command.
1470 PRINT"If you know the name with which you
1480 PRINT"saved the data originally, then enter
1490 PRINT"it, or else type slash ('/')."
1500 PRINT"For S, you must remember to have used
1510 PRINT"the R command to analyse the notes and
1520 PRINT"record the information in memory."
1530 PRINT"P plays the music stored in memory"
1540 PRINT"Press any key":USR(G)
1550 PRINT"There are a few points to remember when"
1560 PRINT"entering music at the end of a program"
1570 PRINT"for analysis. The format for each note  is"
1580 PRINT"1) Range : +/- Very high/low notes"
1590 PRINT"              "/_ High/low notes"
1600 PRINT"                 Middle range"
1610 PRINT"2) Note :        Add the sharp sign in"
1620 PRINT"                 front if necessary
1630 PRINT"3) Note length: As in Sharp BASIC : -"
1640 PRINT" 0   1   2   3   4   5   6   7   8   9"
1650 PRINT"|\  |\  |\  |\  |\  |   |   |   |   |"
1660 PRINT"|\  |\  |\  |   |   |   |   |   |   |"
1670 PRINT"|\  |   |   |   |   |   |   |   |   |"
1680 PRINT"|   |   |   |   |   |   |   |   |   |"
1690 PRINT"●   ●   ●.  ●   ●.  ●   ●.  0   0.  0 "
1700 PRINT"Press any key":USR(G)
1710 PRINT"Example of data at the end of a program:"
1720 PRINT" 2000 REM The Entertainer (Extract)"
1730 PRINT" 2010 DATA 19"
1740 PRINT" 2020 DATA D3,#D3,E3,"C5,E3,"C5,E3,"C6,"C7,+C3,+D3,+#D3,+E3,+C3"
1750 PRINT" 2030 DATA +D3,+E5,"B3,+D5,+C8"
1760 PRINT"Press any key":USR(G):GOTO830


 2000 REM God Save the Queen
 2010 DATA 49
 2020 DATA G5,R0,G5,A5,#F6,G3,A5,B5,R0,B5,"C5,B6,A3,G5,A5,G5,#F5,G8
 2030 DATA "D5,R0,"D5,R0,"D5,R0,"D6,"C3,B5,"C5,R0,"C5,R0,"C5,R0,"C6,B3,A4,B5
 2040 DATA "C3,B3,A3,G3,B6,"C3,"D5,"E3,"C3,B5,A5,G8

 2000 REM It's a long way to Tipperary
 2010 DATA 78
 2020 DATA D3,#D3,F3,R3,F6,R0,F3,G3,A3,#A5,"D5,R5,"D3,"C3,#A5
 2030 DATA G7,#A5,F7,R3,#A3,D3,F4,R0,F6,R0,F3,G3,A3,#A5,"D5,#A3,B3
 2040 DATA "C5,G5,A5,#A5,"C4,"D2,"C3,A3,G3,F3,D3,#D3,F3,R3,F5,F3,R0,F3,G3,A3
 2050 DATA #A5,"D8,#G5,"E5,G5,#A5,"C5,"D7,"D3,R3,#B3,"C3,"D3,R3,"D3,"D6
 2060 DATA #A3,"C3,#A3,G7,F5,#A5,"D5,#A7,"C5,#A8

 2000 REM The Entertainer
 2010 DATA 107
 2020 DATA +D3,+E3,+C3,"A5,"B3,"G5,"D3,"E3,"C3,A5,B3,G5
 2030 DATA D3,E3,C3,_A5,_B3,_A3,_#G3,_G5,R5,G0,B0,"D0,"G5,D3,#D3
 2040 DATA E3,"C5,E3,"C5,E3,"C7,+C3,+D3,+#D3,+E3,+C3,+D3,+E5,"B3,+D5,+C8
 2050 DATA D3,#D3,E3,"C5,E3,"C5,E3,"C8,"A3,"G3,"#F3,"A3,+C3,+E5,+D3,+C3,"A3
 2060 DATA +D8,D3,#D3,E3,"C5,E3,"C5,E3,"C8,+C3,+D3,+#D3,+E3
 2070 DATA +C3,+D3,+E5,"B3,+D5,+C8,R0
 2080 DATA +C3,+D3,+E3,+C3,+D3,+E5,+C3,+D3,+C3,+E3,+C3,+D3,+E5,+C3,+D3,+C3
 2090 DATA +E3,+C3,+D3,+E5,"B3,+D5,+C4
```


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PROGRAMS

```
2000 REM Last section of the Rondo from Mozart's Sonata No 16 in A
2010 DATA 127
2020 DATA -#C0,-E0,-A0,+#C7,-#C0,-E0,-A0,+#C7
2030 DATA +D1,+#C1,-B1,+#C1,+D1,+#C1,-B1,+#C1,+D7
2040 DATA +D0,+#C3,+D0,+#C3,+D0,+#C3,+D0,+#C3,-B6,+E3
2050 DATA -#C0,-E0,-A0,+#C7,-#C0,-E0,-A0,+#C7
2060 DATA +D1,+#C1,-B1,+#C1,+D1,+#C1,-B1,+#C1,+D7
2070 DATA +D0,+#C7,+#C0,-B3,+#C0,-B3,+#C0,-B3,+#C0,-B3
2080 DATA -A5,-E0,-A0,+#C3,R0,+#C1,-E0,-A0,+#C7,-E0,-A0,+#C7
2090 DATA +D1,+#C1,-B1,+#C1,+D1,+#C1,-B1,+#C1,+D7
2100 DATA +D0,+#C3,+D0,+#C3,+D0,+#C3,+D0,+#C3,-B6,+E1
2110 DATA -#C0,-E0,-A0,+#C7,-#C0,-E0,-A0,+#C7
2120 DATA +D1,+#C1,-B1,+#C1,+D1,+#C1,-B1,+#C1,+D7
2130 DATA +D0,+#C7,+#C0,-B3,+#C0,-B3,+#C0,-B3,+#C0,-B3
2140 DATA -A6,+#C4,-A6,+E4,-A6,+#C4,-A3,+#C3,-A3,+E3,-A5,R0,-A5,R0,-A5

2000 REM Minuet in G (Beethoven)
2005 DATA 162
2010 DATA B4,-C2,-D4,-#C2,-D4,-#C2,-D4,-#C2,-D7,-E4,B2,-C7,-D4,A3,B5,R5,G4,A2
2020 DATA B4,#A2,B4,#A2,B4,#A2,B7,A3,G3,R0,G3,#F3,R0,#F3,A3,G3,E3,D3,R5
2030 DATA -D3,-G3,R0,-G5,-#F5,-G5,-A7,-G2,-#F2,-E2,-D2,-C5,B5,-E4,-C2,B5,A5
2040 DATA G4,A2,B4,#A2,B4,#A2,B4,#A2
2050 DATA B7,-D4,#G2,A7,B4,#F2,G5,-D3
2060 DATA -#C3,-D3,B3,-D3,G3,B3,D3,B3,A3,-C3,#F3,A3,D3,#F3,G3,#F3,G3,A3,B3
2070 DATA -#C3,-D3,-#C3,-D3,-E3,-D3,-C3,B3,#A3,B3,-C3,B3,A3,G3,B3,A3,G3,#F3,A3
2080 DATA E3,#F3,G3,E3,#C3,_A3,D5
2090 DATA -D3,-#C3,-D3,-E3,-C3,A3,B3,#A3,B3,-C3,A3,#F3,-D3,-#C3,-D3
2100 DATA -E3,-C3,A3,B3,#A3,B3,-C3,A3,#F3,-D3,-#C3,-D3,B3,-D3,G3,B3,-D3,-G3
2120 DATA -E3,-G3,-C3,-E3,A3,-C3,#F3,A3,D3,E3,F3,#F3,A5,G3
```

Jupiter Ace Antarctica

by David F Corner

Although we're beginning to receive programs written in Forth, and I confidently expect these to arrive in increasing numbers as the popularity of the language grows, 'Antarctica' is the first program I've received that was written on the Jupiter Ace. With the comments omitted, the program just fits into the unexpanded machine.

You are an intrepid explorer off on a little stroll around the South Pole. Unfortunately, you're being pursued by three Yetti look-alikes who enjoy nothing more than tucking into a nice, juicy Antarctic explorer. Your only hope is to try to trap the Yettis into falling into the freezing water while remaining safely on the ice yourself. You use the numbered keys 1–4 to control your speed, and 5-8 for your direction.

Relying on the Jupiter's pixel graphics, the screen display is not quite up to arcade standard but what do you expect in 3k? If you want to up the pace a bit, try running it in FAST mode.

One word of warning: there's no room to perform an EDIT, so if you want to play around with it the author suggests you FORGET RUN, carry out your edit and then type in RUN again.

```
( all numbers are in hex, you should start with : )
16 BASE C!

( data areas contain 8 bytes :
   0,1   increment value - controls speed
   2,3   counter value
   4     x position
   5     y position
   6     x increment
   7     y increment
 one data area for each line    )

CREATE A$ 8 ALLOT
CREATE B$ 8 ALLOT
CREATE C$ 8 ALLOT
CREATE U$ 8 ALLOT

: LD ( loads a data area
```


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PROGRAMS

```
        parameters 4 data words, data area )
4 0 DO
      DUP >R ! R> 2+
    LOOP
  DROP
;

CREATE DL  ( array of 4 direction vectors
       each word is a pair of bytes
       byte 0  x increment
       byte 1  y increment
       each byte takes values 0, 1, 2
       representing          -1, 0, 1)

102 ,          ( right )
  1 ,          ( down  )
100 ,          ( left  )
201 ,          ( up    )

123 VARIABLE RS (seed for random number generator
                 pick your own favourite number! )

: 4R  ( returns a random number
       it will be masked to give only 0,2,4 or 6)
  RS @ 12B9 U*
  SWAP 1+ RS !
;

: IL  ( init a line of the screen )
  EMIT
  1F 1 DO                (NB one-F not IF)
       DUP EMIT
     LOOP
  DROP
  EMIT
;
: IS ( initialise the whole screen )
  CLS
  ASCII ▛ ASCII ▀ ASCII ▜ IL
  16 1 DO
       ASCII ▌ ASCII □ ASCII ▐ IL
     LOOP
  ASCII ▙ ASCII ▄ ASCII ▟ IL
;
( at this point you can check that you are
  setting up the screen correctly.
  If you type
  INVIS IS
  you should find you have a white screen
  with a black border.
  Don't forget to type VIS before continuing )

: ?K  ( test if a key is depressed
       if so sets direction in U$ )
  INKEY  ASCII 1 -
  DUP F8 AND    ( test for range 1-8 )
  IF
     DROP
  ELSE
       DUP 4 AND
       IF
```


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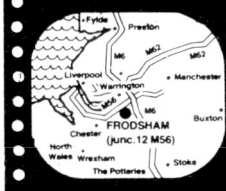

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PROGRAMS

```
        DUP DUP + XOR 6 AND
        DL + @          ( fetch code from DL )
        U$ 6 +
        OVER OVER @ + 202 =
        IF              ( don't allow backwards )
            DROP DROP
        ELSE
            !
        THEN
      ELSE
        1+ 1371 * U$ !          ( change speed )
      THEN
THEN
;

CREATE ?P ( assembly code routine to test
            if a pixel can be unplotted
            input: x-coord y-coord
            returns: flag
              0: pixel has been changed
              1: no change
            uses ROM PLOT code)
 1 C,   B ,       ( LD   BC,000B )  ( NB entered with HL )
 9 C,             ( ADD  HL,BC   )  ( = entry address    )
E5 C,             ( PUSH HL      )
FD C, E3 C,       ( EX   [SP],IY )  ( IY points into code )
48 C,             ( LD   C,B     )  ( BC = 0 meaning unplot )
C3 C, B4F ,       ( JP   B4F     )  ( enter ROM - will return
                                      by JP [IY] )
FD C, E1 C,       ( POP  IY      )  ( restore original IY )
AB C,             ( XOR  E       )  ( A = 0 if no change )
C3 C, C1F ,       ( JP   C1F     )  ( sets flag and returns )

0 VARIABLE T
: GG  ( data area - flag )
      ( 1: increments the count in the data area
        2: if the count overflows,
           tries to move the line forward
        3: if successful, stores the new screen
           position and returns 0
        4: if the line cannot move forward,
           returns non-zero
        5: if the count did not overflow,
           returns 0                    )
 DUP @ 0
 ROT 2+
 DUP >R
 @ 0 D+                 ( stack = count,overflow )
 SWAP I !
 R> SWAP
 IF                     ( if there has been overflow ... )
   2+ >R
   I @
   I 2+ @ 101 - +
   T !                  ( now have new x, new y)
   T C@ T 1+ C@ ?P CALL
   IF                   ( no good )
     R>                 ( address is non-zero )
   ELSE
     T @ R> !
```


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PROGRAMS

```
      0                    ( successful call )
    THEN
  ELSE                     ( no overflow )
    0=                     ( always returns 0 )
  THEN

( WARNING ?P and GG are dangerous.
  double check your typing!
  If you get them wrong, you may have to
  power off and on again to restart! )

: MV  ( data area - flag )
      ( moves along a line in its set direction.
        if it cannot proceed,
        or at a random point
        a new direction is chosen at random.
        if there is no possible direction,
        the line is dead!
        the flag returns 1 if the line is dead )
  >R I GG
  I 2+ @ RS @ XOR
    7FF AND 0=             ( the random test )
  OR
  IF
    4R >R                  ( random start point )
    A  >R                  ( counter - goes to zero
                             after all directions tested )
    BEGIN
      R> 2- >R             ( decrement counter )
      I I' + RS C@ XOR
        6 AND              ( select a direction )
      DL + @
      J 6 + !              ( store it )
      -1 J 2+ !            ( force overflow in GG )
      J GG 0=
       I 0=  OR            ( stop if good direction )
    UNTIL                  ( or count expired       )
    R>
    R> DROP
    IF                     ( count non-zero )
      R> 0=                ( return zero    )
    ELSE
      0 R> ! 1             ( set dead and return 1 )
    THEN
  ELSE                     ( normal or already dead )
    R> @ 0=                ( test for dead )
  THEN
;

: RUN            ( the word to run the complete game )
  IS
  100 163D
    RS @ -7857 - 4763 A$ LD
                 ( there should be a direction change
                   in the middle of this line )
  100 133C 3457 DUP B$ LD
  100 193C 3541 DUP C$ LD
  102 1602 3A55 DUP U$ LD
  BEGIN
```


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PROGRAMS

```
    ?K
    A$ MV
    B$ MV AND
    C$ MV AND           ( true only if all three are dead )
    U$ GG OR            ( or you've hit something         )
  UNTIL
  -1 U$ !
  U$ GG
  IF                    ( you're still alive - you win! )
    400
  ELSE                  ( you're dead - you lost !      )
    88
  THEN
  300 BEEP
;
```

Apple II Screencopy

by H C Grant

'Screencopy' is an Apple utility program written in UCSD-Pascal. It will run under Pascal versions 1.1 and 2.1.

The program allows the user to create a single-screen layout of text which can subsequently be saved to disk as a data file under the filename SCREENCOPY.DATA. The program includes procedures for saving and loading the screen by acting directly on the Apple textscreen buffer in order to increase the running speed.

The main use of the program is to aid in the creation of 'HELP' screens which can then be called by the reader's own program.

Full cursor-controlled screen editing is provided, with the facility for normal, inverse and flashing characters. As far as possible, the editing controls are identical to the standard Pascal editor:–

CTRL–Q: Quit the program
–I: Inverse characters
–N: Normal characters
–B: Flashing characters
–O: Cursor up
–L: Cursor down
←: Cursor left
→: Cursor right
RETURN: New line
CTRL–R: Read stored screen, abandoning current display
–P: Put current screen to disk, overwriting stored file.

It should be noted that 'Screencopy' only allows 40-column screens to be created (40x25 lines) and is therefore incompatible with the 80-column Pascal card.

In its present form, 'Screencopy' can only save a single screen per disk since it uses the same filename every time. Modifying the program to handle multiple screens should give a few readers something to do in their tea-break.

Note that you need to have the System Library present when compiling the program.

```
USES APPLESTUFF;

CONST           CTRLQ = 17;
                CTRLI = 09;
                CTRLN = 14;
                CTRLB = 02;
                CTRLO = 15;
                CTRLL = 12;
                LEFTA = 08;
                RIGHTA= 21;
                CTRLP = 16;
                CTRLR = 18;
                CTRLX = 24;

                CURCHR=' ';


TYPE             BYTE   = 0..255;
                 PA     = PACKED ARRAY[0..1] OF CHAR;
```

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PROGRAMS

```
                MEMLOC = RECORD CASE BOOLEAN OF
                           TRUE : ( ADD : INTEGER);
                           FALSE: ( DATA: ^PA    );
                         END;
                PPA    = PACKED ARRAY[0..1024] OF BYTE;

                MODETYPE = (NORMAL,INVERSE,FLASHING);
                DIRECTION= (UP,DOWN,LEFT,RIGHT);


VAR
          LNSTART    : ARRAY[0..23] OF INTEGER;
          CH         : CHAR;
          CURX,CURY  : INTEGER;
          WRITEMODE  : MODETYPE;
          SAVEDCHAR  : CHAR;
          CTRLCODES  : SET OF BYTE;
          DONE       : BOOLEAN;

(*************************************><*************************************)
(*                                                                         *)
(*                  P R O C E D U R E   L I S T I N G S                    *)
(*                                                                         *)
(*************************************><*************************************)


PROCEDURE SETLNSTART;
          BEGIN
               LNSTART[00]:=1024;     LNSTART[01]:=1152;     LNSTART[02]:=1280;
               LNSTART[03]:=1408;     LNSTART[04]:=1536;     LNSTART[05]:=1664;
               LNSTART[06]:=1792;     LNSTART[07]:=1920;     LNSTART[08]:=1064;
               LNSTART[09]:=1192;     LNSTART[10]:=1320;     LNSTART[11]:=1448;
               LNSTART[12]:=1576;     LNSTART[13]:=1704;     LNSTART[14]:=1832;
               LNSTART[15]:=1960;     LNSTART[16]:=1104;     LNSTART[17]:=1232;
               LNSTART[18]:=1360;     LNSTART[19]:=1488;     LNSTART[20]:=1616;
               LNSTART[21]:=1744;     LNSTART[22]:=1872;     LNSTART[23]:=2000;
          END;(* PROCEDURE SETLNSTART *)


FUNCTION  INVCHAR(CH:CHAR) : CHAR ;   (* PRODUCES REVERSE FIELD CHARACTERS     *)
          BEGIN
               INVCHAR:=CHR(ORD(CH) MOD 64);
          END;


FUNCTION  FSHCHAR(CH:CHAR) : CHAR ;   (* PRODUCES FLASHING FIELD CHARACTERS    *)
          BEGIN
               FSHCHAR:=CHR((ORD(CH) MOD 64) + 64);
          END;


FUNCTION  NMLCHAR(CH:CHAR) : CHAR ;   (* PRODUCES NORMAL FIELD CHARACTERS      *)
          BEGIN
               NMLCHAR:=CHR((ORD(CH) MOD 64) + 128);
          END;


PROCEDURE BELLS(N:INTEGER);
          BEGIN
               FOR N:=N DOWNTO 1 DO WRITE(CHR(7));
          END;


PROCEDURE GETCHAR(CURX,CURY:INTEGER; VAR CH:CHAR);   (* GETS CHAR FROM BUFFER *)
          VAR CORE : MEMLOC;
          BEGIN
               CORE.ADD:=LNSTART[CURY]+CURX;
               CH:= CORE.DATA^[0];
          END;

PROCEDURE PUTCHAR(CURX,CURY:INTEGER; CH:CHAR);       (* PUTS CHAR INTO BUFFER *)
          VAR CORE : MEMLOC;
          BEGIN
               CORE.ADD:=LNSTART[CURY]+CURX;
               CORE.DATA^[0]:=CH;
          END;


PROCEDURE RETURN;
          BEGIN
               PUTCHAR(CURX,CURY,SAVEDCHAR);
               CURX:=0;CURY:=CURY+1;
               IF CURY >23 THEN CURY:=0;
               GETCHAR(CURX,CURY,SAVEDCHAR);
               PUTCHAR(CURX,CURY,INVCHAR(SAVEDCHAR));
          END;(* PROC RETURN *)


PROCEDURE CURSOR(DIR : DIRECTION);
          BEGIN
```


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PROGRAMS

```
                PUTCHAR(CURX,CURY,SAVEDCHAR);
                CASE DIR OF
                     RIGHT : BEGIN
                                CURX:=CURX+1;
                                IF CURX>39 THEN BEGIN
                                                CURX:=0;CURY:=CURY+1;
                                                IF CURY>23 THEN CURY:=00;
                                              END;
                             END;

                     LEFT  : BEGIN
                                CURX:=CURX-1;
                                IF CURX<0  THEN BEGIN
                                                CURX:=39;CURY:=CURY-1;
                                                IF CURY<00 THEN CURY:=23;
                                              END;
                             END;

                     UP    : BEGIN CURY:=CURY-1; IF CURY<0 THEN CURY:=23 END;

                     DOWN  : BEGIN CURY:=CURY+1; IF CURY>23 THEN CURY:=0 END
                END;(* CASE *)
                GETCHAR(CURX,CURY,SAVEDCHAR);
                PUTCHAR(CURX,CURY,INVCHAR(SAVEDCHAR))
           END;(* PROC CURSOR *)

PROCEDURE SAVEBUFFER;
           CONST NAME          = '#4:SCREENCOPY.DATA';
                 BUFFERSTART   = 1024;
                 BUFFERLENGTH  = 2;  (*  TWO SECTORS = 2K BYTES *)
           VAR   IO            : INTEGER;
                 F             : FILE;
                 STPNT         : MEMLOC;
           BEGIN
                PUTCHAR(CURX,CURY,SAVEDCHAR);
                STPNT.ADD:=BUFFERSTART;
                REWRITE(F,NAME);
                IO:=BLOCKWRITE(F,STPNT.DATA^,BUFFERLENGTH);
                CLOSE(F,LOCK);
                PUTCHAR(CURX,CURY,INVCHAR(SAVEDCHAR))
           END;



PROCEDURE LOADBUFFER;
           CONST NAME          = '#4:SCREENCOPY.DATA';
                 BUFFERSTART   = 1024;
                 BUFFERLENGTH  = 2;  (*  TWO SECTORS = 2K BYTES *)
           VAR   IO            : INTEGER;
                 F             : FILE;
                 STPNT         : MEMLOC;
           BEGIN
                STPNT.ADD:=BUFFERSTART;
                RESET(F,NAME);
                IO:=BLOCKREAD(F,STPNT.DATA^,BUFFERLENGTH);
                CLOSE(F,LOCK);
                CURX:=0;CURY:=0;
                GETCHAR(CURX,CURY,SAVEDCHAR);
                PUTCHAR(CURX,CURY,INVCHAR(SAVEDCHAR))
           END;


PROCEDURE INITIALISE;
           BEGIN
                SETLNSTART;
                UNITCLEAR(1);
                WRITE(CHR(12));(* CLEARSCREEN *)
                GOTOXY(40,0);   (* CLEARCURSOR *)
                WRITEMODE:=NORMAL;
                CURX:=0;CURY:=0;
                DONE:=FALSE;
                GETCHAR(CURX,CURY,SAVEDCHAR);
                PUTCHAR(CURX,CURY,INVCHAR(SAVEDCHAR));
                CTRLCODES:=[CTRLO,CTRLI,CTRLN,CTRLB,CTRLO,CTRLL,
                                                  LEFTA,RIGHTA,CTRLP,CTRLK,CTRLX];
           END;(* PROC INITIALISE *)

BEGIN (* MAIN PROGRAM *)

  INITIALISE;

  REPEAT
        READ(KEYBOARD,CH);

        IF EOLN(KEYBOARD)
        THEN RETURN
        ELSE
             BEGIN

               IF ORD(CH) IN CTRLCODES
               THEN
                   BEGIN
```

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```
                CASE ORD(CH) OF

                    CTRLQ   : DONE:=TRUE;
                    CTRLI   : WRITEMODE:=INVERSE;
                    CTRLN   : WRITEMODE:=NORMAL;
                    CTRLB   : WRITEMODE:=FLASHING;
                    CTRLO   : CURSOR(UP);
                    CTRLL   : CURSOR(DOWN);
                    LEFTA   : CURSOR(LEFT);
                    RIGHTA  : CURSOR(RIGHT);
                    CTRLP   : SAVEBUFFER;
                    CTRLR   : LOADBUFFER;
                    CTRLX   : INITIALISE

                END (* CASE *)
            END
        ELSE
            CASE WRITEMODE OF

            NORMAL    : BEGIN
                          SAVEDCHAR:=NMLCHAR(CH);CURSOR(RIGHT)
                        END;
            INVERSE   : BEGIN
                          SAVEDCHAR:=INVCHAR(CH);CURSOR(RIGHT)
                        END;
            FLASHING  : BEGIN
                          SAVEDCHAR:=FSHCHAR(CH);CURSOR(RIGHT)
                        END;
            END;(* CASE *)
    END;

UNTIL DONE;

WRITE(CHR(12));(* CLEARSCREEN *)
```

MZ-80K Spelling master

by Maurice Webb

The lack of good educational software is a hobby-horse of mine which I'll bore you with some other time, but meanwhile I'm happy to receive well-written and useful educational programs. 'Spelling master' is a relatively straightforward spelling-tester which is both easy to use and almost crashproof.

The program allows the teacher to enter a list of up to ten words which it stores in an array. The computer then briefly flashes each word in turn onto the screen and asks the user to enter the correct spelling; the idea being that the word is visible long enough to be recognised but not long enough for the exact spelling to be remembered. The delay is adjustable to allow for different age ranges. The words are drawn from the array in a random order and added to a list on the right-hand side of the screen as they are attempted. Three attempts are allowed for each word, following which the computer prints the answer across the screen one character at a time.

When the whole list has been attempted, the computer displays the score and waits for a key press before re-running.

As the program stands in the listing given below, you have to enter a 'key code' before being allowed to use it. Failure to press the correct key (top right-hand corner of the keyboard) results in an exit to the Sharp monitor without warning. Since you then have to reload both Basic and 'Spelling master', this is irritating to say the least. If you really want to prevent unauthorised access to the program, I strongly suggest deleting line 70 and rewriting line 60 to read as follows:–

60 GET C$: IF C$ <> "▚" THEN60

One criticism of the program is that it is possible to lose the screen display by repeated pressing of the carriage return key when input is expected. This detracts from an otherwise foolproof program, so I suggest adding a short routine to check for a null string and repositioning the cursor accordingly. Also, the program doesn't always clear previous responses from the screen; this can be cured by adding spaces to line 550.

The listing given below was written in Extended Sharp Basic (*cf. pp.* 178-181, March *PCW*), but notes for converting to standard Basic are given in REM statements at the end of the listing. It should also be relatively simple to add extra pages or allow for the use of cassette data files since the program is written in modular form to assist adaptation and modification.

Please note that line 120 prevents

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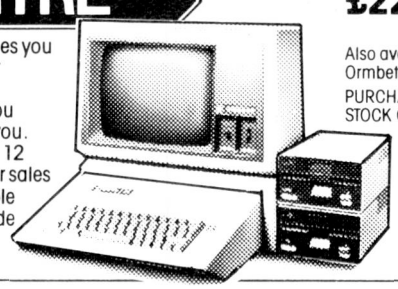

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PROGRAMS

LISTing, and line 130 disables the BREAK key, so it's obviously a good thing to test the program for keying-in errors before adding these lines!

```
10 REM ********************************
20 REM ***     Spelling-Master      ***
30 REM ***   C.Maurice Webb 1983    ***
40 REM ********************************
50 PRINT"■Please enter key-code"
60 GET C$:IF C$=""THEN 60
70 IF C$<>"%"THEN BYE
80 PRINT"■":GOSUB 320:GOSUB 390
90 GOSUB 460
100 REM————————Start Testing————————
110 RT=0:S=0:T=2:WR=0
120 POKE 10680,1:POKE 10681,1
130 POKE 6639,24:POKE 7933,13:POKE 7934,195:POKE 7935,183:POKE 7936,30
140 FOR I=1TODY*870:NEXT
150 PRINT"■   ═══   Spelling - Master   ═══"
160 PRINT"   ————————————————————————"
170 GOSUB 590:GOSUB 630:PRINT@17,1:"Answer = ":J=1000:GOSUB 1000
180 RN=INT(NR*RND(1))+1:CR=3
190 IF CK(RN)<>0 THEN 180
200 GOSUB650:USR(62):PRINT@12,5:IN$(RN)
210 J=1000:GOSUB1000:GOSUB 630
220 GOSUB 530
230 PRINT @17,1:"Answer = "::INPUT AN$:IF AN$=IN$(RN) THEN CK(RN)=1:GOTO250
240 GOTO 700
250 GOSUB 670
260 PRINT@ T+RN*2,25:IN$(RN)
270 J=2500:GOSUB1000:FOR I=1TONR
280 IF CK(I)=0 THEN 180
290 NEXT
300 GOTO 840
310 END
320 REM——— Set up Spelling List ———
330 INPUT"How many entries ?  ";NR
340 LOGIC
350 IF NR>10 THENPRINT"■Max No of entries per page is 10":PRINT:GOTO 330
360 INPUT"No. of seconds delay ";DY
370 PRINT"Enter";NR;" spellings + <CR>"
380 RETURN
390 REM——— Enter Spellings ————————
400 DIM IN$(NR),CK(NR),WG(NR)
410 FOR I=1 TO NR
420 INPUT IN$(I)
430 CK(NR)=0:WG(NR)=0
440 NEXT
450 RETURN
460 REM——— Print-up List ————————
470 PRINT"■   ═══   Spelling - Master   ═══"
480 PRINT"   ————————————————————————"
490 FOR I=1TONR
500 PRINT @T+I*2,25:IN$(I)
510 NEXT
520 RETURN
530 REM——— Clear Answer Space ————————
540 PRINT@17,0:"
550 PRINT@18,0:"                              "
560 PRINT@19,0:"
570 RETURN
580 REM——— Answer Block ————————
590 PRINT@11,4:"┌──────────────────┐"
600 PRINT@12,4:"│                  │"
610 PRINT@13,4:"└──────────────────┘"
620 RETURN
630 PRINT@12,4:"▌ ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒ ▐
640 RETURN
650 PRINT@12,5:"                  "
660 RETURN
670 REM——— Correct Answer ————————
680 PRINT@17,1:"    *  Correct  *    "
690 J=1000:GOSUB1000:RT=RT+1:GOSUB 530:RETURN
700 REM——— Wrong Answer ————————
710 LN=LEN(IN$(RN)):PU=0:SP=4:W=0
720 CR=CR-1:IF CR=0 THEN 770
730 PRINT@19,4:"X  Try Again   X":J=1000:GOSUB1000
740 PRINT@19,2:"                              "
750 GOSUB 530
760 GOTO 200
770 PRINT@19,3:"X X Still Wrong X X":J=1000:GOSUB1000:GOSUB 530
780 LN=LEN(IN$(RN))
790 PU=PU+1
800 PRINT@17,SP;MID$(IN$(RN),PU,1):IF PU=LN THEN 820
810 PRINT@17,SP+2:" ":SP=SP+2:J=500:GOSUB 1000:GOTO790
820 J=5000:GOSUB1000:GOSUB 530:WR=WR+1:CK(RN)=1:GOSUB 530
830 WG(RN)=1:GOTO 270
840 REM——— End of Program ————————
850 PRINT"■   ═══   Spelling - Master   ═══"
860 PRINT"   ————————————————————————"
870 PRINT@8,6:"You had";RT;" right and";WR;" wrong":IF WR=0 THEN 940
880 PRINT@11,6:"You need to learn":PRINT:PRINT:PRINT
890 FOR I=1TONR
900 IF WG(I)=0 THEN 920
910 PRINTIN$(I),
```


BASIC PROGRAMMERS . . .

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PROGRAMS

```
920 NEXT
930 GOTO 960
940 PRINT@11,9;"W E L L   D O N E !"
950 PRINT@21,5;" .      END OF PROGRAM"
960 PRINT@23,5;"< Press any key to continue >"
970 GET Q$:IF Q$=""THEN 970
980 RESTORE:FORI=1TONR:CK(I)=0:NEXT:GOTO 90
990 REM------- Pauses -------
1000 FOR I=1TOJ:NEXT:RETURN
1010 REM
1020 REM ┌──────────────────────────┐
1030 REM |    Original in Extended |
1040 REM |    Basic (PCW March 83)  |
1050 REM |    Notes for re-writing  |
1060 REM |                          |
1070 REM |   Line  70 Change "&"    |
1080 REM |         120 Stops LISTing|
1090 REM |         130 Stops BREAKing|
1100 REM |         200 USR(62) Beeps|
1110 REM |         340 Omit         |
1120 REM |         PRINT"&"=CLS     |
1130 REM |         PRINT@Line,Col;  |
1140 REM |         J=Delay Time     |
1150 REM |                          |
1160 REM | IMPORTANT - OMIT LINES 120|
1170 REM |  & 130 UNTIL REST PERFECT|
1180 REM └──────────────────────────┘
```

BBC Bigwords

By Q A Rice

How's this for efficient programming? 'Bigwords' allows you to enter six lines of up to ten characters each on your BBC Computer. The program displays them on the screen in large letters with each line in a different colour, and all in 233 bytes! It works by testing the POINT value of each pixel of the input string and then plotting the pixels in a larger scale using no more than some clever arithmetic and a couple of FOR . . . NEXT loops. The program works on both models and uses MODE 2 graphics.

I know we published BBC Bigprint in the April issue, but I decided that 'Bigwords' was worth printing if only for its effective use of BBC Basic. For variety, you might like to try running the program without line 100.

```
>  LIST
   10MODE2:VDU28,0,2,19,0
   20FOR I=0TO5
   30PRINT''"LINE ";I+1;" MAX 10 CHARS"
   40INPUTA$
   50FORJ=0TO32STEP4
   60FORK=0TO640STEP8
   70W=POINT(K+64,960+J):GCOL0,(W/7)*(I+1)
   80X=12:Y=K*2:Z=J*4+(768-(I*152))
   90MOVEY,Z:MOVEY,Z+X:PLOT85,Y+X,Z+X
  100MOVEY,Z:PLOT85,Y+X,Z
  110NEXTK,J,I
  130PRINT'':VDU30
```

PET Histogram

by Sid Thomas

'Histogram' requires a 3000 or 4000 series PET with a 3022 or 4022 printer.

The program produces neat, hardcopy histograms of data entered by the user. Both axes together with the histogram as a whole may be given labels if desired, and the user is asked to select the required shading for each bar.

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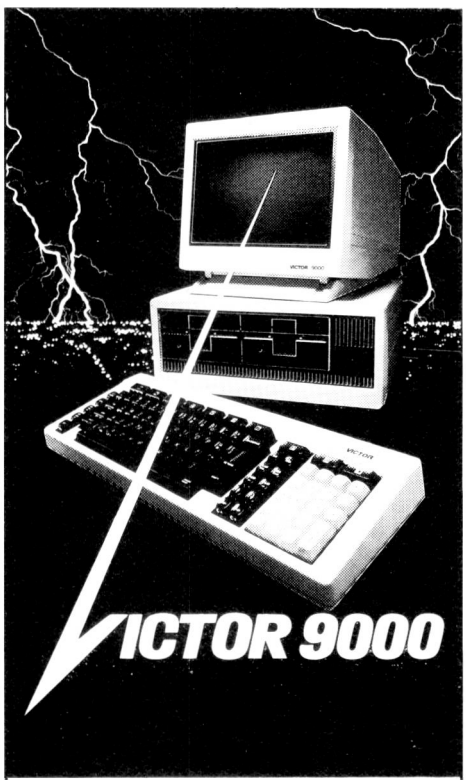

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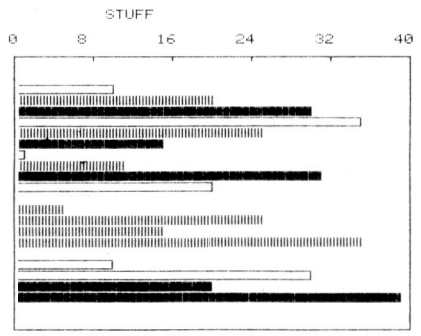
PROGRAMS

again, cloth ears' and 'Buffoon — outside range'.

The program uses programmable characters to provide high-density resolution bars, and produces a quality good enough for semi-formal presentations (see example below). Use of the program is straightforward and the input prompts are self-explanatory.



Sample printout of Histogram

```
60 DATA65,65,65,65,65,65,65,65,65,65,65,127,65,65,65,127,0,0,0,127,0,127,0,127
70 DATA0,127,0,127,0,0,127,127,127,127,127,127,127,127,127,127,127,0,0
80 L$=CHR$(141):DIMS$(10)
90 FORN=1TO7
100 FORM=1TO6
110 READA:S$(N)=S$(N)+CHR$(A)
120 NEXTM
130 NEXTN
140 PRINT"■ENTER TITLE OF HISTOGRAM■■":INPUTT$
150 PRINT"■■HISTOGRAM BARS ARE DRAWN HORIZONTALLY■"
160 PRINT"LEFT——>RIGHT [X AXIS]"
170 PRINT"■■ENTER XMAX■■":INPUTXX:PRINT"■■ENTER XMIN■■":INPUTXN
180 PRINT"■■ENTER AXIS LABEL■■":INPUTX$
190 PRINT"■XMIN——>XMAX CAN BE UP TO 50 UNITS WIDE■"
200 PRINT"ENTER WIDTH - MAKE IT A NICE MULTIPLE■"
210 PRINT"OF"(XX-XN)"■■":INPUTW%
220 IFW%>50THENPRINT"■■■TRY AGAIN, CLOTH EARS■■":GOTO200
230 PRINT"■■■HOW MANY DIVISIONS ALONG THE■":PRINT"X AXIS?■"
240 PRINT"BE SENSIBLE AND CHOOSE A SIMPLE■"
250 PRINT"FACTOR OF "W%"■■":INPUTI%
260 A$="┌":B$="└"
270 FORN=1TOW%-1
280 N%=N%+1:B$=B$+"─"
290 IFN%=W%/I%THENA$=A$+"┬":N%=0:GOTO310
300 A$=A$+"─"
310 NEXT
320 A$=A$+"┐":B$=B$+"┘":B=XN:S=1+LEN(STR$(XX)):T$="■"+T$
330 OPEN1,4:PRINT#1:PRINT#1:PRINT#1,SPC(25)T$
340 PRINT#1:PRINT#1:PRINT#1,SPC(35)X$:PRINT#1
350 PRINT#1,SPC(24)XN;L$;
360 FORN=1TOI%-1
370 B=B+(XX-XN)/I%:S$=STR$(B):C=23+(N*(W%/I%))
380 PRINT#1,SPC(C)LEFT$(S$,S);L$;
390 NEXT
400 PRINT#1,SPC(23+W%)XX
410 OPEN2,4,6:PRINT#2,CHR$(24):PRINT#1,SPC(25)A$
420 E=E+1:PRINT"■■BAR #"E
430 PRINT"■■ENTER LABEL [<21 CHARACTERS]■"
440 PRINT"TO LEAVE A GAP, ENTER ■T■ BELOW■"
450 PRINT"TO OMIT A LABEL, ENTER ■*■":PRINT"TO FINISH ENTER ■!■■":INPUTC$
460 IFLEN(C$)>20THENPRINT"■■■HAVE YOU NO BRAIN??■■":GOTO430
470 IFC$="↑"THENPRINT#1,SPC(25)"|"SPC(W%-1)"|":GOTO420
480 IFC$="!"THEN820
490 IFC$="*"THENC$=""
500 C$="                    "+C$
510 PRINT#1,SPC(4)RIGHT$(C$,20);L$;
520 PRINT"■■CHOOSE SHADING FOR THIS BAR■"
530 PRINT"UNSHADED = ■1■":PRINT"STRIPED  = ■2■":PRINT"BLACK    = ■3■■":INPUTSH
540 ONSHGOTO560,570,580,550
550 PRINT"■■■A LITTLE MORE CONCENTRATION PLEASE■■":GOTO520
560 S$(8)=S$(1):S$(9)=S$(2):S$(10)=S$(3):GOTO590
570 S$(8)=S$(4):S$(9)=S$(4):S$(10)=S$(5):GOTO590
580 S$(8)=S$(6):S$(9)=S$(6):S$(10)=S$(7)
590 PRINT"■■ENTER DATA VALUE■■":INPUTX
600 IFX<XNORX>XXTHENPRINT"■■■BUFFOON - OUTSIDE RANGE■■":GOTO590
610 X=(X-XN)*W%/(XX-XN)-.5:OPEN3,4,5:PRINT#3,S$(8):PRINT#1,SPC(25)"|";
620 IFX<.25THENPRINT#1,"| ";:GOTO790
630 IFX<.75THENPRINT#1,L$;:PRINT#3,S$(10):PRINT#1,SPC(26)CHR$(254);:GOTO790
640 IFX<1.25THENPRINT#1,L$;:PRINT#3,S$(9):PRINT#1,SPC(26)CHR$(254);:GOTO790
650 IFX<1.75THENPRINT#1,L$;:PRINT#3,S$(8):PRINT#1,SPC(26)CHR$(254);:GOTO780
660 IFX-INT(X)<.25THEN720
670 IFX-INT(X)<.75THEN760
680 GOSUB840
```

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BASIC PROGRAM

PROGRAMS

```
690 PRINT#1,CHR$(254);L$;
700 PRINT#3,S$(9);:PRINT#1,SPC(26+X)CHR$(254);
710 GOTO790
720 GOSUB840
730 PRINT#1,L$;
740 PRINT#3,S$(9);:PRINT#1,SPC(25+X)CHR$(254);
750 GOTO790
760 GOSUB840
770 PRINT#1,CHR$(254);
780 PRINT#1,L$;:PRINT#3,S$(10);:PRINT#1,SPC(26+X)CHR$(254);
790 PRINT#1,L$;:CLOSE3
800 PRINT#1,SPC(25+W%)"|"
810 GOTO420
820 PRINT#1,SPC(25)B$:OPEN4,4,10:PRINT#4:PRINT#1:CLOSE1:CLOSE2:CLOSE4
830 END
840 FORN=1TOINT(X)-1
850 PRINT#1,CHR$(254);
860 NEXT
870 RETURN
READY.
```

BBC Quadsolve

by I Kingston

The second half of 'Quadsolve'. As mentioned in BLUDNERS, part of the listing went missing last month. The following lines should be added to the listing published in July to complete the program.

```
670 IFK%>1 THENPRINTTAB(22-LEN(A$)-5);K%;
680 IFM%>1 THENPRINTTAB(21);M%
690 GOTO870
700 O$=O$+"x":IFABS(M%)>1 THENO$=O$+STR$(M%)
710 O$=O$+"x"+CHR$(43-2*(SGN(N%)=-1))+STR$(ABS(N%))+")=0"
720 PRINTCHR$(241);TAB(22-LEN(O$));O$
730 O$="x=0 or ":IFABS(M%)>1 THENO$=O$+STR$(M%)
740 O$=O$+"x"+CHR$(43-2*(SGN(N%)=-1))+STR$(ABS(N%))+")=0"
750 PRINTCHR$(241);TAB(22-LEN(O$));O$
760 PRINT'TAB(22-LEN(O$)+9);"x=";-N%/SGN(M%)
770 IFABS(M%)>1 THENPRINTTAB(21);"-";CHR$(8);CHR$(10);ABS(N%);TAB(25);"isolved"
780 GOTO870
790
800 PRINT'"Cannot be factorised"'
810 PRINT"x=";-B%;CHR$(243);CHR$(244);"(";B%^2;CHR$(-43*(SGN(-4*A%*C%)=1));
    -4*A%*C%;")"
820 PRINTTAB(2);STRING$(4+LEN(STR$(-B%))+LEN(STR$(B%^2))+LEN(STR$(-4*A%*C%)),"-");TAB
ution"
830 PRINTTAB(5);2*A%
840 IFA%=0 ORB%^2-4*A%*C%<=0 THENPRINT'"No real solution":GOTO870
850 PRINT" x=";(-B%+(SGN(B% 2-4*A%*C%))/(2*A%);" or "
860 PRINT"x=";(-B%-(SGN(B%^2-4*A%*C%)))/(2*A%)
870 PRINT'"More?"
880 REPEATUNTILINKEY$(0)<>""
890 CLEAR
900 GOTO200
910 DEFPROCfactorise
920 n=ABS(A%)
930 c=0
940 FORf=1 TO INT(SQR(n)+1)
950   IF(n/f)<>INT(n/f) THEN970
960   c=c+2:IFZ=1THENA(c-1)=f:A(c)=n/f
970   NEXT
980 IFZ=0 THENDIMA(c):A(0)=c:Z=1:c=0:GOTO940
990 Z=0
1000 n=ABS(C%)
1010 c=0
1020 FORf=1 TO INT(SQR(n)+1)
1030   IF(n/f)<>INT(n/f) THEN1050
1040   c=c+2:IFZ=1THENC(c-1)=f:C(c)=n/f
1050   NEXT
1060 IFZ=0 THENDIMC(c):C(0)=c:Z=1:c=0:GOTO1020
1070 Z=0
1080 FORf=1 TOA(0) STEP2
1090   FORg=1 TOC(0) STEP2
1100     IFSGN(A%)=1 THENK%=A(f):M%=A(f+1) ELSEK%=-A(f):M%=A(f+1)
1110     IFSGN(C%)=1 THENL%=C(g):N%=C(g+1) ELSEL%=-C(g):N%=C(g+1)
1120     IFK%*N%+M%*L%=B% THENZ=1:ENDPROC
1130     L%=-L%:N%=-N%
1140     IFK%*N%+M%*L%=B% THENZ=1:ENDPROC
1150     IFSGN(A%)=1 THENK%=-A(f):M%=-A(f+1) ELSEK%=A(f):M%=-A(f+1)
1160     IFSGN(C%)=1 THENL%=-C(g):N%=-C(g+1) ELSEL%=C(g):N%=-C(g+1)
1170     IFK%*N%+M%*L%=B% THENZ=1:ENDPROC
1180     L%=-L%:N%=-N%
1190     IFK%*N%+M%*L%=B% THENZ=1:ENDPROC
1200     NEXT:NEXT
1210 ENDPROC
1220 DEFPROChighcf
1230 f=1
1240 l=ABS(A%)
1250 IF1=0 ORABS(B%)<1 ANDB% THEN1=ABS(B%)
1260 IF1=0 ORABS(C%)<1 ANDC% THEN1=ABS(C%)
1270 FORn=1 TO1 STEP-1
1280   IF1/n<>INT(1/n) THEN1300
1290   IFA%/n=INT(A%/n) ANDB%/n=INT(B%/n) ANDC%/n=INT(C%/n) THENf=n:A%=A%/n:B%=B%/n:C%
PROC
1300   NEXT
1310 ENDPROC
```


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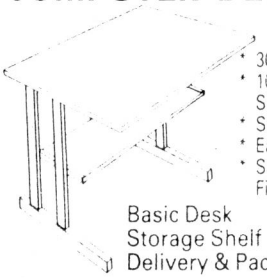

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Xitan Systems 60/68/69

Y

Z

Zak 23
Zynar 131
Zen 312

CHIP CHAT

How nice to hear that Uncle Clive has won the knighthood he deserves! While we all know the difficulties which have at times befallen Sinclair Research, we cannot ignore the fact that the man put Britain on the map as far as the microcomputer industry is concerned, even selling the ZX81 to Japan. But, of course, Guy 'bloodhound' Kewney got it right in our February issue, under the newsprint headline of 'Arise, 'Sir' Clive'—eat your heart out, Nostradamus . . . While on the subject of ZX computers, Interface, the magazine of the National ZX Users' Club, hammered out its final issue recently. Oddly, this memorable issue contained details of a Vet's work with his ZX Spectrum, which includes using it to illustrate the reproductive organs of a ewe for the benefit of his students. The chap's name is (yes, really) J M Ewing . . . Anonymity seems to be all the rage this month. An anonymous press release magically appeared in the mail. It said, under the heading 'Cheesed Off': 'Recent reports which appear to give Apple the credit for developing the mouse, used with its new Lisa microcomputer, have caused Xerox to be cheesed off. The hand operated device, which enables users to carry out functions simply by pointing at the computer screen was, in fact, first developed by Xerox as part of its award-winning 8010 executive work station. Its introduction was generally acclaimed as a considerable advance in making microcomputers 'user friendly' at the executive level. It seems the 'mouse' has since become an industry term.' Well, it certainly wasn't Apple who sent us that. The press release, though, is probably true; the weight of truth resting upon the word 'developed' in connection with Xerox. Xerox was the first company to sell the mouse as part of a microcomputer system but the mouse was originally invented in 1965 by Stanford Research Institute, USA—or that is the first record we can find of it. It was probably Xerox or some loony academic who sent us the above treatise . . . Anonymous(e) telephone calls this time. A gentleman phoned *PCW* claiming he hailed from a 'well-known software house'. Not wishing to reveal his identity, he informed *PCW* that the latest *Printout* contained a review of the game Frantic from Imagine Software in Liverpool. However, he said, Frantic is not available and nor are there any copies of it for review. He suggests we challenge *Printout* for its review copy, but of course we'd never do something so sensationalist! He kindly added that, since he wished to remain anonymous, any money *PCW* might have paid him for this information can 'go into the Xmas box'. Meanwhile he'd better ring off 'in case the conversation's being taped' . . . Occasionally people make mistakes. Compsoft did recently. It sent us a press mailing describing a comparison between Compsoft's Delta, DBase II and Silicon Office. Written by Andrew Brack and Associates of Newcastle upon Tyne, the comparison was not intended for publication. Now Compsoft has retracted the whole thing because the writer was not 'prepared to substantiate the findings detailed' . . . There are some peculiar ways of making use of Videotex. We hear that the new Tandata adaptor, the TD1100, is being recommended by the Antiques Register for the use of its clients in accessing the register's database—ring in the new . . . And, at the same time, TeleviSin, a 'televised sin network' will provide televised gambling services in Connecticut, USA. This, according to consultancy firm International Resource Development, could result in one stop gambling . . . Software house Audiogenic reckons that claims on programmers' salary levels by several software houses are 'exaggerated'. Readers will be familiar with the fact that some programmers boast salaries in excess of £30,000 and sometimes as much as £85,000 per annum. Audiogenic's MD, Martin Maynard, reckons that Audiogenic's software is so damned good and in such demand that 'it would be foolish not to give incentives to our staff'. He is not prepared to reveal what these incentives are, but says that, 'while other software houses claim to pay programmers up to £100,000 per annum, ours pay at least that in tax' . . . Wasn't the Election fun? All those politicians slinging manure in each other's faces, kicking around all the old political footballs with renewed vengeance—Britain vibrated for a month with their braying and heckling. Better than Coronation Street, any day. Even the micro industry was dragged, kicking and screaming, into the fray: nationalisation versus private enterprise in the micro industry. A Conservative party press release said Labour's manifesto 'threatened' to establish a significant public stake in electronics'—that is, nationalise it. The Conservatives, perhaps rightly, claim that as the micro industry is a successful one which affects all of us—not just those who work in it—it should remain in private hands. 'Under nationalisation,' says the release, 'the industry's bright prospects would be destroyed.' It also outlines a shopping list of large computer companies for the Labour party to peruse at leisure—jokingly, of course!



'Sorry—we've only just started using these things, and you're a programming error.'

BLUDNERS

Fear not confused BBC owners! The solution is at hand. Half of the 'Quadsolve' listing in last month's issue disappeared somewhere in the murky depths of our artroom. All is revealed in this month's 'Programs'.

I really thought we'd heard the last of Oric Bug-Eater. The July corrections, however, provided only a partial solution. The answer, according to Mr P Sims, is to add a further line:

```
10095 X=X+(X=38)-(X=2):
Y=Y+(Y=26)-(Y=2):
PLOT X,Y,"$"
```

Note: Would P Baker, author of PET Zombies, give me a ring. I returned your materials in the *sae* provided and the post office have sent it back as *addressee not known*.

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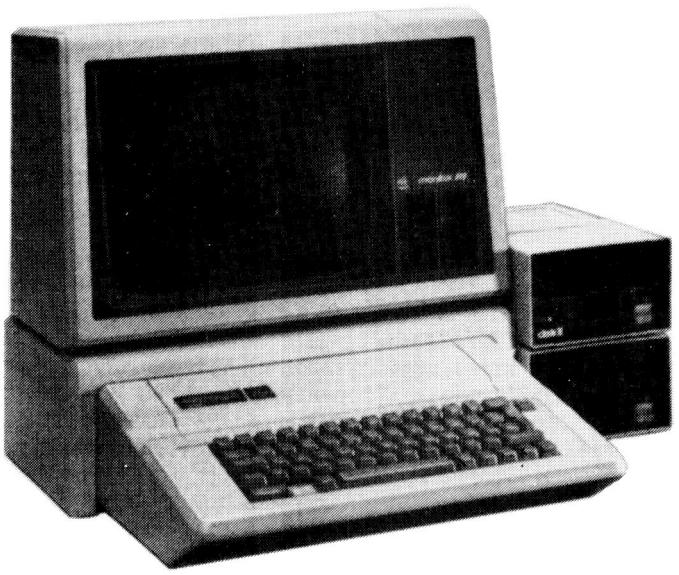



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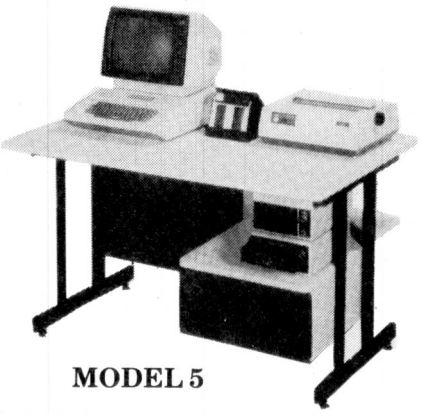

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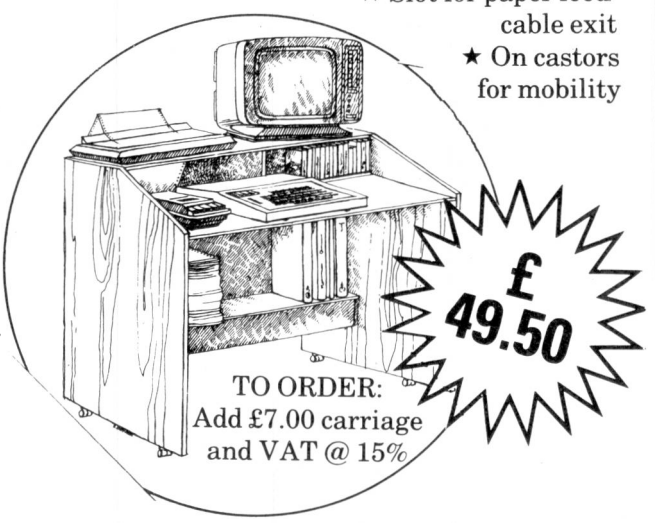

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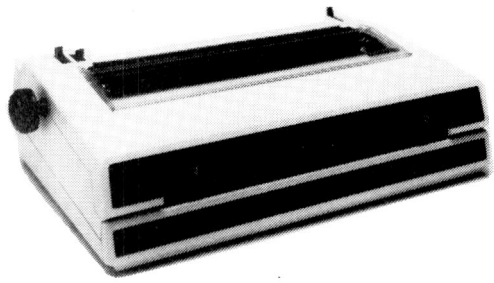

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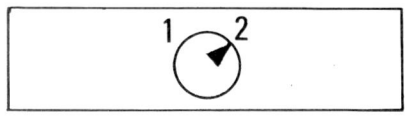

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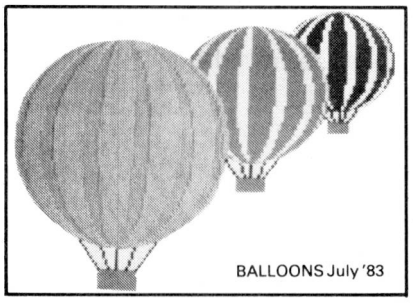

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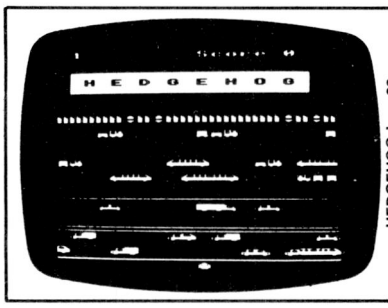

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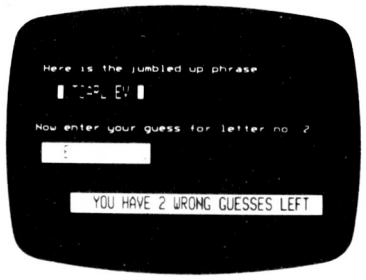

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April/May Issue Special Anniversary Issue – Contains index to the whole of BEEBUG Volume 1. Music Composer – create complex 3 part harmonies with this synthesiser Program. **Colour bar chart generator** program. Beeb implementation of the **Connect-Four Game. Invasion** – a 16k. Plus **Review of Tape Recorders** for the Beeb; a Basic Program Editor, which lists variables and procedures, and executes Find and Replace in a Basic Program; **Reviews of Acornsoft Games** and the **Torch Z80 Disc** Pack. Disc Menu Program. Newcomers introduction to Mode 7. How to save the unsaveable; and a routine to print Double Height Characters in all modes.

June Issue: Program features **'Return of the Diamond'** a 16K adventure game, **'Hedgehog'** a well implemented 'Frogger' type game, and **Ellipto**. Create your own off the shelf sound effects with **Sound Wizard**. Plus articles on **Using Files, Rotating and Expanding Characters, Using Printers**, and **How to multi-program the User Keys**. Reviews of **The Hobbit Floppy Tape system, Adventure Games,** and a **Comparative Review of Wordwise and View**. Plus **FX Call Update, Disc Program Auto-relocator, Wordwise Update**, and more **BBC Book Reviews.**

July Issue Games: Robot Attack (32k) and Anagrams, a 16k word game. Watching the Beeb at work – a simple program to show your micro at work. An introduction to discs – what are they and are they worth getting. Balloons – a coloured animation. Make your micro speak like Kenneth Kendal. Bad Program Lister – lists programs even when the computer pronounces them 'bad'. Reviews of Epson and Seikosha's new printers. Five books of programs reviewed, plus more software reviews. Using Files part 4. A full disc sector editor program – to read and retrieve lost disc files. And how to modify Acornsoft's Planetoid. Plus hosts of useful hints.

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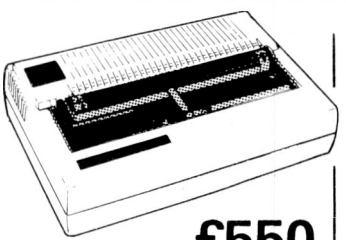

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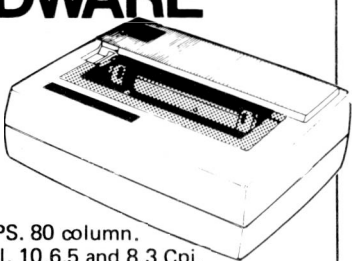

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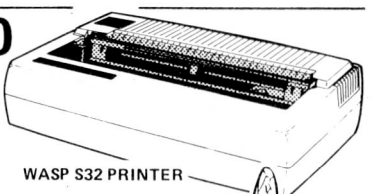

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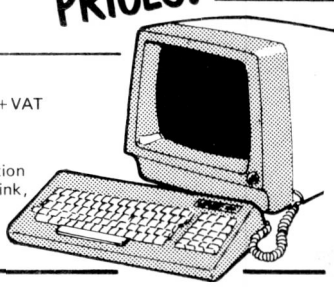

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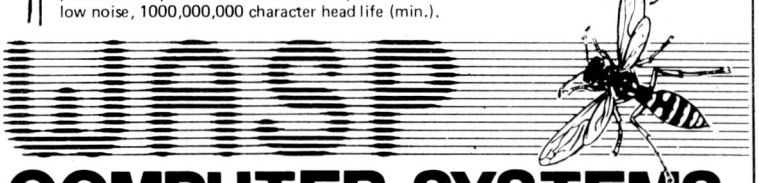

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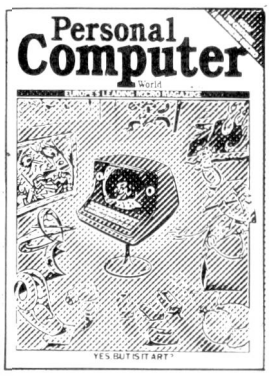
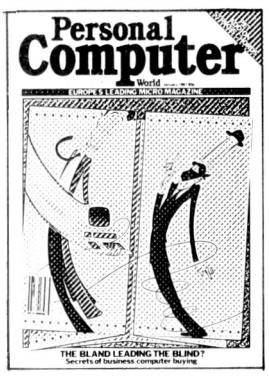


Volume 3 No 12
December 1980
Benchtest: Microwriter/Printerfacing: Series — Part 1/Sharp PC-1211 speed-up/Programs: TRS-80 Tarot, PET Cat & Mouse, PET Rebound, MZ-80K Alligator Swamp, PET Connect, UK101 Minefield, PET Simon Benchtest: Raannd SP1



Volume 4 No 1
January 1981
Benchtest: Transam Tuscan/Realtime control using trains — part 1/Recover from a data tape disaster/PET Music Multi-user systems — part 1/Programs: TRS80 Four in a row, TRS80 Target Practice, PET Convoy, PET Wire, PET Maze Chase, PET Android Attack, PET Anagram



Volume 4 No 3
March 1981
Benchtest: Onyx C8002/Benchtest: Bigboard/Micro music software package/ALC circuit/Commons report/HP 43C/Programs: TRS80 Show Jumping, PET Grand Prix, PET Aircraft landing, PET Bouncy.

Volume 4 No 5
May 1981
Benchtest: Pascal 640/WP Benchtest: Magic Wand/PET colour/Low-cost digital tape system/Using calculator printers on micros/Apple music-making/Multi-user Benchtest:



MVT-Famos/Programs: PET Grand Prix, PET Aircraft Landing, PET Bouncy.



Volume 4 No 6
June 1981
Benchtest: NEC PC-8001/Multi-user Benchtest: MP/M/Benchtest: Sinclair ZX81/West Coast Faire Report/Radio Teletype/WP Benchtest: Wordpro 4 plus/Budget tape interface/Further Casio quirks/Programs: UK101 Zor, PET.



Volume 4 No 7
July 1981
Benchtest: Sharp PC-3201/Multi-user Benchtest: Acorn Econet/Case study: Accident investigation on TRS-80/Zilog Z8 family/WP Benchtest: Format-80/Pascal Benchmarks: readers letters/Quicker Casio computations/Programs: ZX80 Sliding letters, UK101 Car Rally, TRS-80 Calendar, UK101 m/c code to Basic converter, PET Exam Questions, MZ-80K Designer, ZX91 Sketch Pad.



Volume 4 No 8
August 1981
Benchtest: Tandy Model III/Viewdata update/WP Benchtest: Spellbinder/Printer survey/Microholism/Programs: ZX80 Othello; Easter Sunday; Apple Mondrian; MZ-80K Duck Shoot; PET Gomoku; MZ-80K Football.



Vol 4 No 12
December 1981
Benchtests: Sharp MZ-80B Philips P2000/School network/BBC Micro inside story/'Turtle' Graphics for Apple/Forth language/Curve fitting/Calc corner: HP14C review/Programs: PET Fantasy, ZX81 Battleships and cruisers.



Vol 5 No 3
March 1982
Benchtests: Texas Instruments 99/4A, Hewlett-Packard 125/Choosing a Database/Compsoft DMS Reviewed/Screenplay (new series)/Calc Corner: Hewlett-Packard Interface Loop/Programs: TRS-80 Solitaire, TRS-80 Ducks, Nascom Business Documents, MZ-80K Race Chase, ZX81 Graphplot.



Volume 5 No 4
April 1982
Benchtest; Monroe OC8820/DB Benchtest: FMS-80/Checkout: Sid 1/Generating screen forms/Comal/Logo/Brain Dump-New series/Calc Corner: Casio FP-10 printer/Programs: TRS-80 Maths & Trig, PET Boot the Cat, ZX81 Resistor & Res code.



Vol 5 No 6
June 1982
Benchtests: Sharp MZ-80A/ZX Spectrum/Database Benchtest: DBMS2/West Coast Faire Report/Lisp/VIC 20 games/Calc Corner: Sharp PC1500/Programs: RML Altered Basic/VIC 20 Large Characters/BBC Breakout/VIC 20 Trailblazer/MZ-80K Next-to-Last-One/MZ-80K Tarot.

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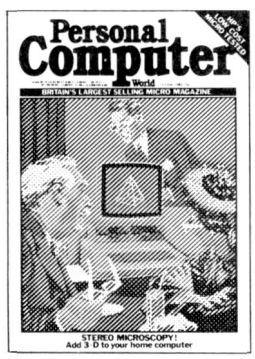
Vol 5 No 9
September 1982
Benchtest: Olivetti M20/Word Processor Benchtest: Select for NEC/Database Benchtest: Aquila/Checkouts: Microwriter Revisited, E40 Data Compression/Screenplay: ZX81 Pt II/DIY Logo/P for Perfect/Beeb Colour Hi Res/RS232/Calc Corner:



HP15 and 16C reviewed/Programs: Video Genie Extended Basic, ZX81 Alphabetising, PET File Comparison, BBC Music Player, PET Virus, BBC Radar, PET German Game, TRS-80 Cardshuffler.



Vol 5 No 10
October 1982
Benchtests: HP-86; Positron 9000/Database Benchtest; Personal Pearl/3D Graphics for BBC Computer/Hashing Techniques/Designing your own Database/CP/M-86 v MSDOS/Clock-Calendar Card for Apple II/Calc Corner: hints for Sharp PC122/Programs: ZX81 Star Trek; PET Knockout; PET Trains.



Vol 5 No 12
December 1982
Benchtest: Epson HX-20/Database Benchtests comparison/Pluto Board/Walters 100 printer/Motorola MC68000/Ada/Intelligence test for computers/European Micro Chess Championship/Computer Scrabble/Spectrum books/Calc Corner — complex arithmetic on Sharp PC1211/Screenplay — TRS-80 Colour Computer/Programs — PET Firebird/Teepee Textpro/PET Search and Rescue/Atari Colour Selector.



Volume 6 No 3
March 1983
Benchtests: Corvus Concept, Computers Lynx/Database Benchtest: DataPrism/Which Spreadsheet? — Prophet II/IBM 9000 Instrumentation Computer/Apple Word Handler/Networks — Part II/ZX81 Graphics Module/Sharp MZ-80K Enhancements/Micro Chess — the Conchess range/Screenplay — Atari 800/Portable Computer World — hex listings for Casio fx602p and Sharp PC1211/Programs: Atari Animation/Chinese Horoscopes/PET Patience.



Vol 6 No 6
June 1983
Benchtests: Colour Genie, Hitachi MB16001/Database Benchtest: Tomorrow's Office/Which Spreadtest? — VisiCalc/Occam/Logo/Lisp/Accountancy Aid/Financial Director/Crossword Magic/Cross Figures/Spectrum/Screenplay — Jupiter Ace and Oric-1/Compact Disc/Micro Chess/Programs: BBC Balloon/Apple VAT/MZ-80K Trains/Oric-1 Titles/Commodore 64 Sprite Editor/Spectrum Blaster.



Vol 6 No 7
July 1983
Benchtests: Apple Lisa, Epson QX-10, Osborne Executive/Database Benchtest: OMNIS/Which Spreadsheet? — ECalc Printer — Epson FX-80/Microtax/Micronet 800/Cryptography/Diskography/Forth/Warnier Orr programming/1983 Reader Survey/Portable Computer World — Sharp PC1500/Screenplay — Colour Genie games/Micro Chess — the Phantom/Programs: BBC TV Test, Atom Four-stoke Cycle, ZX81 Spectrum Least Squares, BBC Mickey, Genie SLC-2, MZ-80K Forth Interpreter, TRS-80/Video Genie Domain of the Djinn/BBC Cross-hair Cursor/Apple II Menucreate, Oric-1 Word Scrambler Conversion, BBC Quadsolve, Newbrain Genin.

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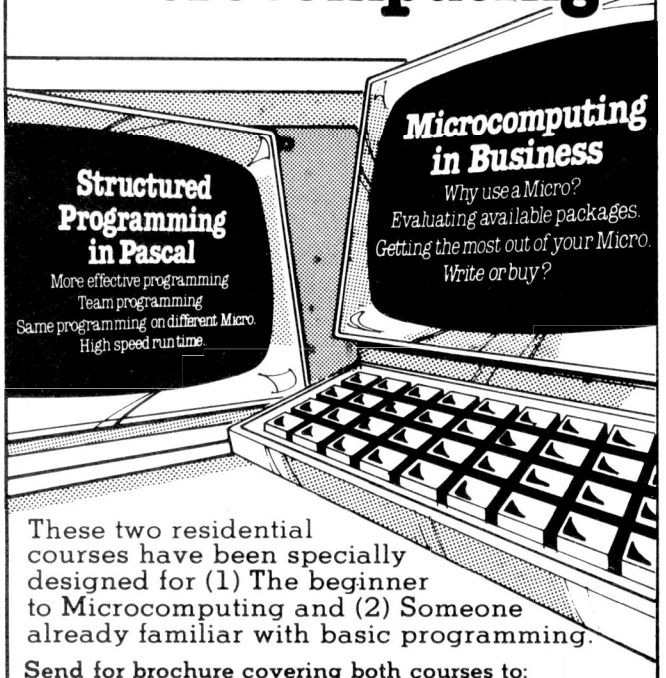

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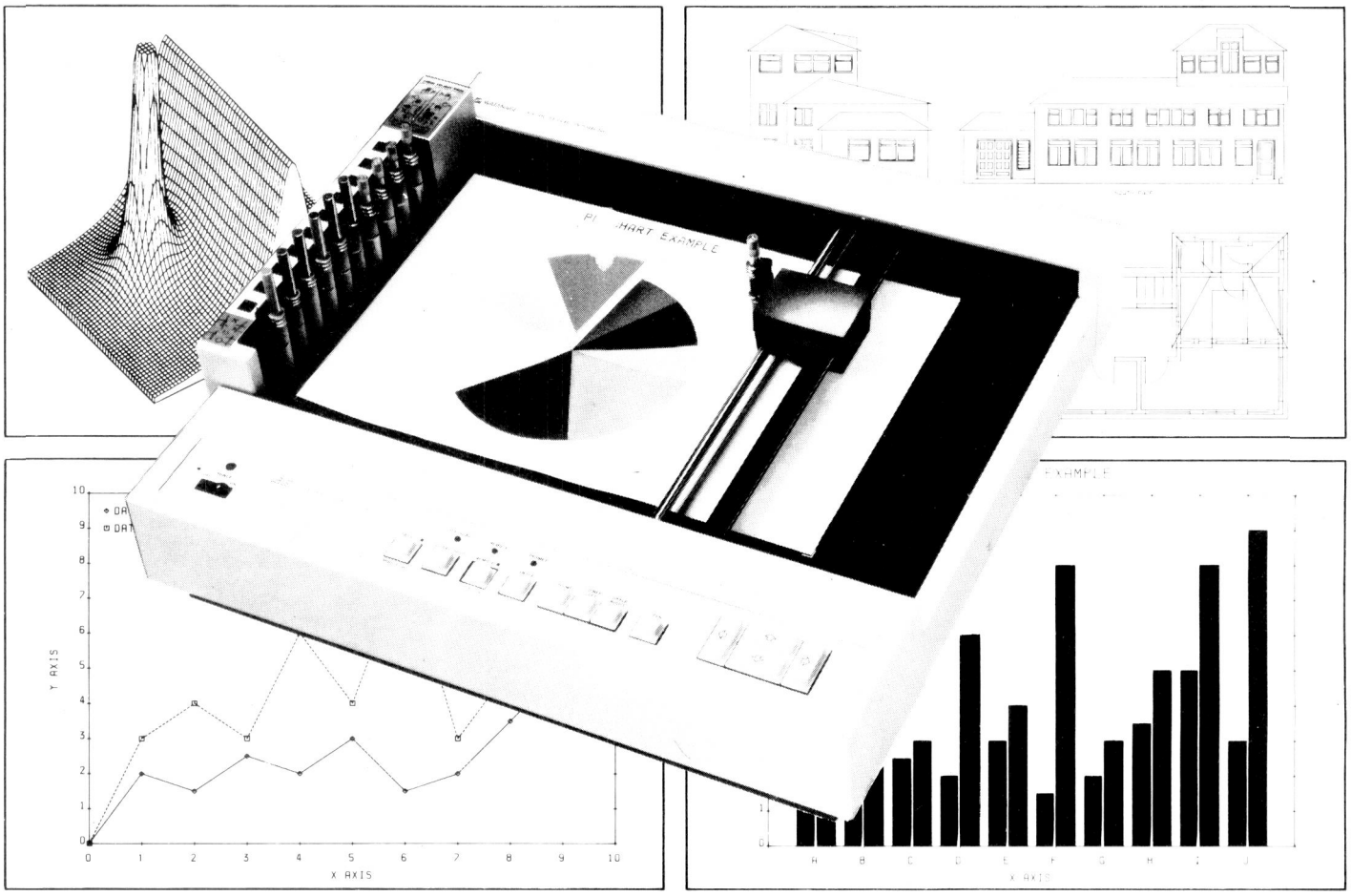

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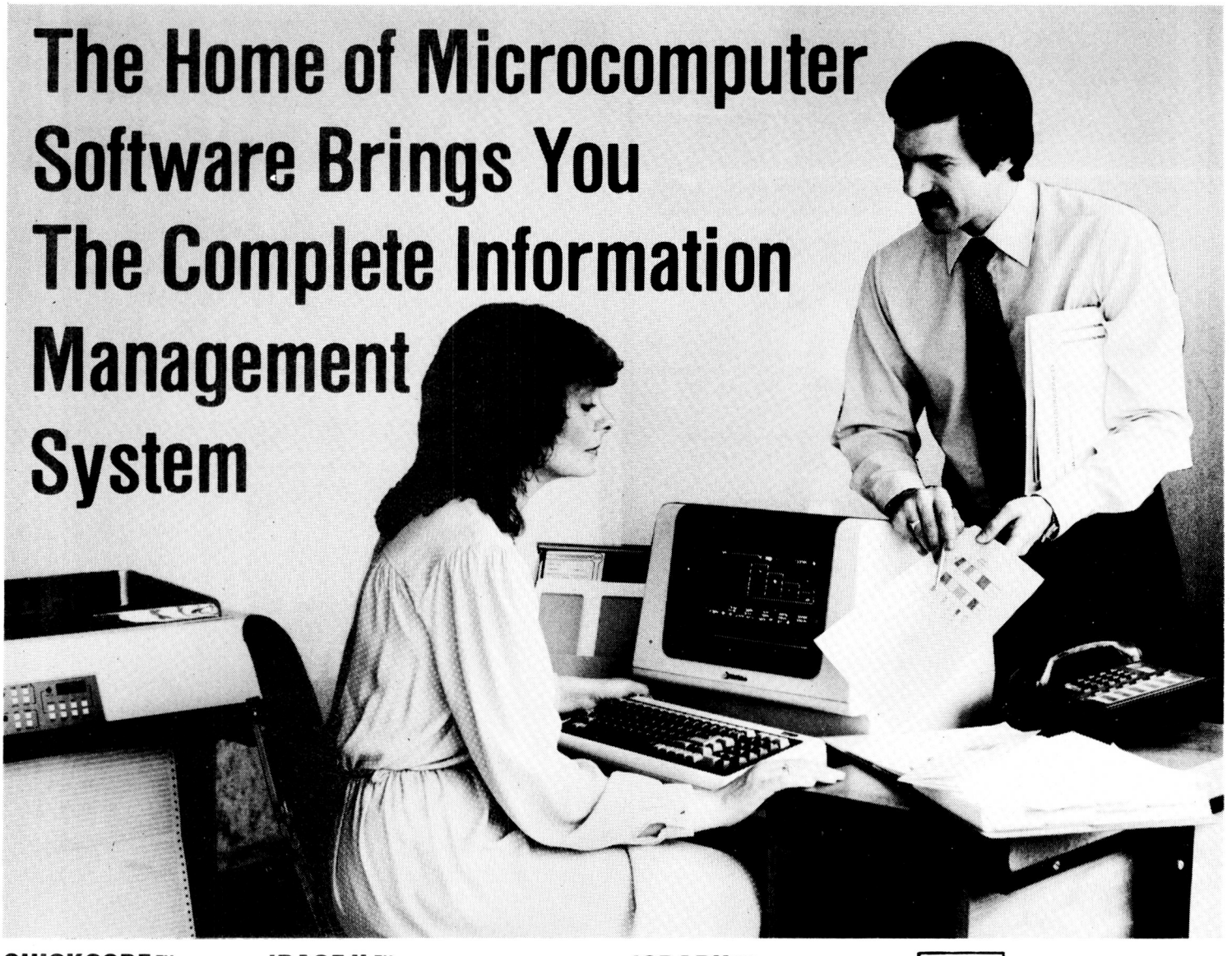

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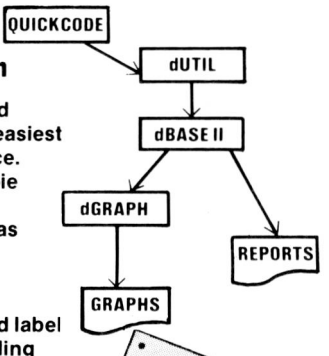

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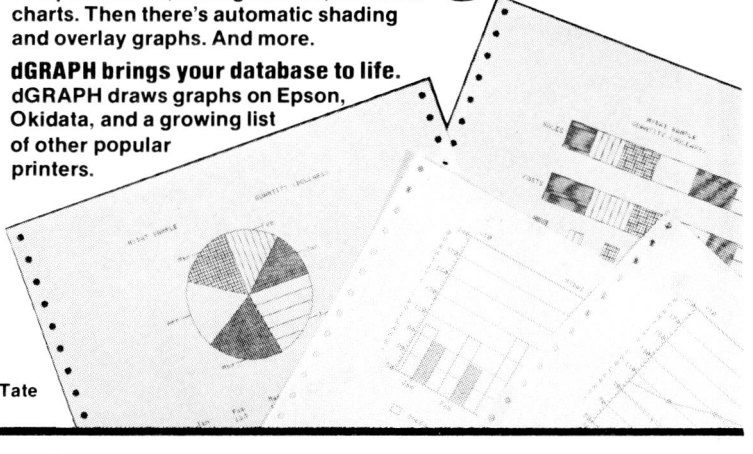

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COMPUTER 'CAB'



All in one quality computer cabinet with integral switched mode PSU, Mains filtering, and twin fan cooling. Originally made for the famous **DEC PDP8** computer system costing thousands of pounds. Made to run 24 hours per day the PSU is fully screened and will deliver a massive +5v DC at 17 amps, +15v DC at 1 amp and –15v DC at 5 amps. The complete unit is fully enclosed with removable top lid, filtering, trip switch, 'Power' and 'Run' LEDs mounted on Ali front panel, rear cable entries, etc. etc. Units are in good but used condition – supplied for 240v operation complete with full circuit and tech. man. **Give your system that professional finish** for only £49.95 + Carr. Dim. 19" wide 16" deep 10.5" high. Useable area 16"w 10.5"h 11.5"d.
Also available **LESS PSU**, with FANS etc. Internal dim. 19"w. 16"d. 10.5"h. ***£19.95***. Carriage & insurance £9.50.

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Keep your hot parts COOL and RELIABLE with our range of **BRAND NEW** professional cooling fans.
ETRI 99XUOI Dim. 92 x 92 x 25 mm. Miniature 240 v equipment fan complete with finger guard. **£9.95.**
GOULD JB-3AR Dim. 3" x 3" x 2.5" compact very quiet running 240 v operation. **NEW £6.95**
BUHLER 69.11.22. 8-16 v DC micro miniature reversible fan. Uses a brushless servo motor for extremely high air flow, almost silent running and guaranteed 10,000 hr life. Measures only 62 x 62 x 22 mm. Current cost £32.00. **OUR PRICE ONLY £12.95 complete with data.**
MUFFIN-CENTAUR standard 4" x 4" x 1.25" fan supplied tested EX EQUIPMENT 240 v at £6.25 or 110 v at £4.95 or BRAND NEW 240 v at £10.50. 1000's of other fans Ex Stock. Call for Details. Post & Packing on all fans £1.60

8" FLOPPY DISK DRIVES



Unbelievable value the DRE 7100 8" floppy disk drives utilise the finest technology to give you 100% bus compatibility with most drives available today. The only difference being our **PRICE** and the superb manufacturing quality!! The 7100 single sided drive accepts hard or soft sectoring IBM or ANSI standard formats giving a massive 0.8 MB of storage. Absolutely SHUGART, BASF, SIEMENS etc. compatible. Supplied BRAND NEW with user manual and full 90 day warranty. **7100 Single sided £225.00** + Carriage and insurance £10.00.

Optional accessories: Full technical manual £20.00 alone. £10.50 with drive. Refund of difference on drive purchase. DC and AC power connector and cable kit £8.45. 50 way IDC connector £5.50. 50 way ribbon cable £3.20 per metre.

RECHARGEABLE NICADS

SAFT VR2C 1.2v 'C' size nicads. 18 cells in ex equipment pack. Good condition – easily split to single cells. ***£9.50*** + £1.90 post and packing.

VIDEO MONITORS

12" CASED. Made by the British KGM Co. Designed for continuous use as a data display station, unit is totally housed in an attractive brushed aluminium case with ON-OFF, BRIGHTNESS and CONTRAST controls mounted to one side. Much attention was given to construction and reliability of this unit with features such as, internal transformer isolated regulated DC supply, all components mounted on two fibre glass PCB boards – which hinge out for ease of service, many internal controls for linearity etc. The monitor accepts standard 75 ohm composite video signal via SO239 socket on rear panel. Bandwidth of the unit is estimated around 20 Mhz and will display most high def graphics and 132 x 24 lines. Units are secondhand and may have screen burns. However where burns exist they are only apparent when monitor is switched off. Although unguaranteed all monitors are tested prior to despatch. Dimensions approx. 14" high x 14" wide by 11" deep. Supplied complete with circuit. 240 volt AC operation. ***ONLY £45.00 PLUS £9.50 CARR.***

24" CASED. Again made by the KGM Co with a similar spec as the 12" monitor. Originally used for large screen data display. Very compact unit in lightweight alloy case dim. 19" H x 17" D x 22" W. All silicon electronics and composite video input make an ideal unit for schools, clubs, shops etc. Supplied in a used but working condition.
ONLY £55.00 PLUS £9.50 CARR. & INS.

14" COLOUR superb chassis monitor made by a subsidiary of the HITACHI Co. Inputs are TTL RGB with separate sync. and will plug direct into the BBC micro etc. Exceptional bandwidth with good 80 col. definition. Brand new and guaranteed. Complete with full data & circuit. 240 v AC working. Dim. 14" x 13" x 13".
ONLY £199.00 PLUS £9.50 CARR.

SUPER DEAL? NO – SUPER STEAL!!

The FABULOUS 25CPS TEC Starwriter
Daisy wheel printer at a fraction of its original cost.

BRAND NEW AT ONLY £499 + VAT



Made to the very highest spec the **TEC Starwriter FP1500-25** features a heavy duty die cast chassis and DIABLO type print mechanism giving superb registration and print quality. Micro-processor electronics offer full DIABLO/QUME command compatability and full control via CPM Wordstar etc. Many other features include bi directional printing, switchable 10 or 12 pitch, full width 381 mm paper handling with upto 163 characters per line, friction feed rollers for single sheet or continuous paper, internal buffer, standard RS232 serial interface with handshake. Supplied absolutly **BRAND NEW** with 90 day guarantee and **FREE** daisy wheel and dust cover. Order **NOW** or contact sales office for more information. Optional extras: RS232 data cable **£10.00**. Tech manual **£7.50**. Tractor feed **£140.00**. Spare daisy wheel **£3.00**. Carriage & Ins. (UK Mainland) **£10.00.**

TELETYPE ASR33 I/O TERMINALS



FROM £195 + CAR. + VAT

Fully fledged industry standard ASR33 data terminal. Many features including ASCII keyboard and printer for data I/O auto data detect circuitry. RS232 serial interface. 110 baud, 8 bit paper tape punch and reader for off line data preparation and ridiculously cheap and reliable data storage. Supplied in good condition and in working order
Options: Floor stand ***£12.50*** + VAT
KSR33 with 20ma loop interface ***£125.00*** +
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SOFTY 2

The amazing SOFTY 2. The complete "toolkit" for the open heart software surgeon. Copies, Displays, Emulates ROM, RAM and EPROMS of the 2516, 2532 variety. Many other features include keyboard, UHF modulator. Cassette interface etc. Functions exceed capabilities of units costing 7 times the price! Only
£169.00 pp £1.95 *Data sheet on request*

DATA MODEMS

Join the communications revolution with our range of EX TELECOM data modems. Made to most stringent spec and designed to operate for 24 hrs per day. Units are made to the CCITT tone spec. With RS232 i/o levels via a 25 way 'D' skt. Units are sold in a tested and working condition with data. Permission may be required for connection to PO lines.

MODEM 13A compact, async, same size as telephone base. Up to 300 baud, full duplex over 2 wires, but call mode only **£75.00**

MODEM 2B/C Fully fledged, up to 300 baud async, ANSWER & CALL modes, auto answer, auto switching, ideal networks etc. Just 2 wire connection to comms line. **£85.00**

MODEM 20-1 Compact unit for use with PRESTEL or full duplex 2 wire link. 75 baud transmit – 1200 baud receive. Auto answer. **£130.00**

MODEM 20-2 same as 20-1 but 75 baud receive 1200 baud transmit. **£130.00**

MODEM 20-3 Made for data rates up to 1200 baud in full duplex mode over 4 wire circuit or half duplex mode over 2 wires. **£130.00**
Carriage. 13A £4.50. 2B/C & 20 £9.50.

DATA PUMP MODEM compact unit upto 1200 baud full duplex over 4 wires or half duplex over 2 wires. BELL specification with data i/o via RS232 25 way D socket, remote test etc. 240 v operation. Supplied complete with data **£65.00** carr. £4.50.

For more information or details of other types of ex. stock modems contact sales office.

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EX TELECOM. Direct connect. 2 wire, European standard, 75/1200 baud data modems. Normally priced at £140.00, we have a limited quantity of guaranteed working, but cosmetically defective (ie scratches and scuffs on panels etc.) units at a super low price of only ***£49.95***. Modems are made to the highest standard and conform to the CCITT tone spec. Ideal for **MICRONET, PRESTEL** or **DISTEL's** forthcoming high speed ports. Standard RS232 data i/o via 25 way D skt. With data.
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8" WINCHESTER price SLASH

S100 Bus 19 Mb. Subsystem. A cancelled order and change of policy by a major British disk drive manufacturer enables us to offer you 'last year's model' at a plug in and ready to go SUPER LOW PRICE. Our own custom controller pugs direct into the S100 bus and will control 2 disk drives, offering a total storage of OVER 36 Mbs! and at data transfer rates in excess of 7 Mb/sec seeing is believing!! Supplied complete with user configurable BIOS etc. Save a fortune, Limited quantity only.

3100 19 Mb. Disk drive	***£499.00***	**PSU unit**	***£165.00***
CD1100 controller & BIOS	***£345.00***	**PSU extension cable**	***£9.95***
Full tech Manual	***£20.00***		

Special SUBSYSTEM prices. 1 x 3100 disk + PSU + Controller ***£799.00***
or 2 x 3100 disks + 2 PSU + Controller ***£1295.00***
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Mixed Semis amazing value contents include transistors, digital, linear, I.C.'s triacs, diodes, bridge recs., etc. etc. All devices guaranteed brand new full spec. with manufacturer's markings, fully guaranteed, 50+ ***£2.95*** 100+ ***£5.15***.
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All prices quoted are for U.K. Mainland, paid cash with order in Pounds Stirling PLUS VAT. Minimum order value ***£2.00***, Minimum Credit Card order ***£10.00***. Minimum BONA FIDE account orders from Government depts., Schools, Universities and established companies ***£20.00*** Where post and packing not indicated please ADD **60p + VAT** Warehouse open Mon-Fri 9.30 — 5.30. Sat. 10.15 — 5.30. We reserve the right to change prices and specifications without notice. Trade, Bulk and Export enquiries welcome.

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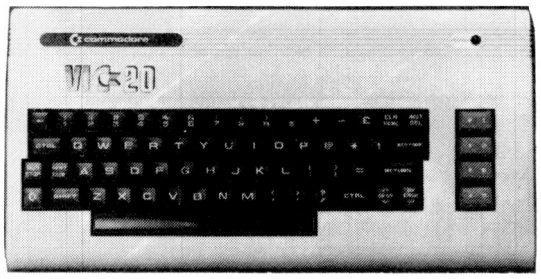

CBM 64

The Latest Colour Computer with 64K Memory and Music Synthesizer

FEATURES

Full Colour, Music Synthesizer, High Resolution Graphics with sprites for 3D effects. Full Size Typewriter Keyboard, Pet Basic.

NEW PRICE: £229.99 inc VAT and FREE CASSETTE DECK

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JUST SEND £199.00 + Carriage AND WE WILL PAY THE VAT AND SEND YOU A CBM64

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SINGLE DRIVE FLOPPY £229.00 inc VAT

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All prices Subject to Manufacturers Price Changes

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West Midlands
Tel: (0203) 66162

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TOTAL £
+ CARRIAGE £ 5.00
£

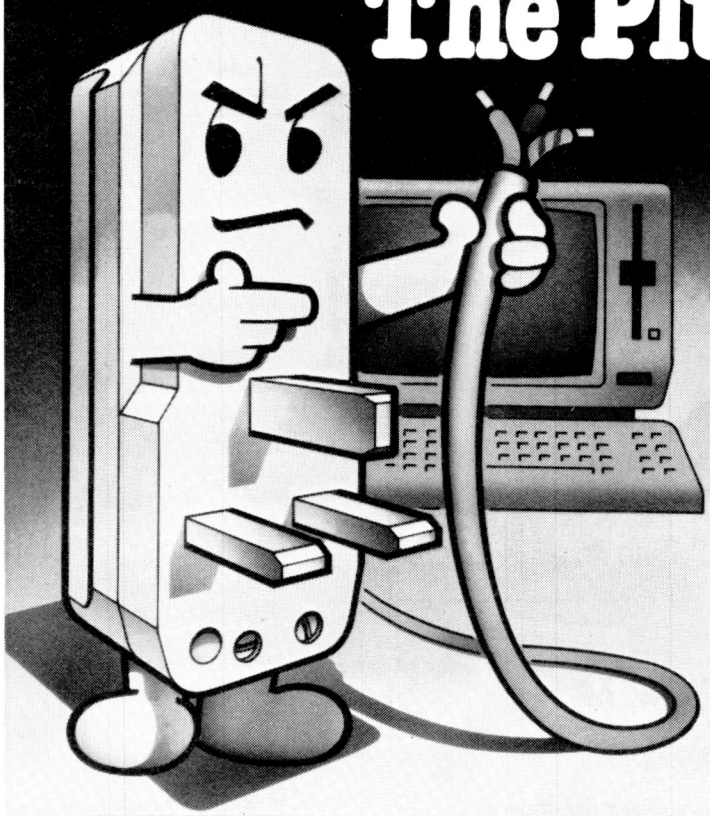
*I enclose Cheque/Postal Order for £

NAME ..... ADDRESS ..... TEL. NO .....

Signed ..... * Please charge my Barclaycard/Access No.

Or telephone order *Delete as required

The Plug says 'No' to dirty power.



WARNING: Unfiltered power can damage your computer's health.

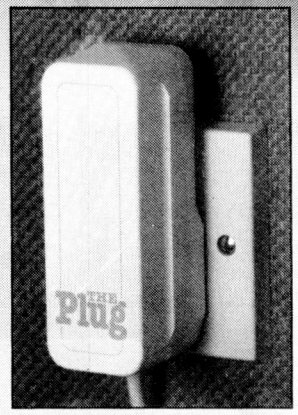
WHY

Because dirty power is the most likely cause of the unexplained errors and circuit malfunctions which can upset all micro based products and their users.

HOW

The Plug with its own built in filter and transient suppressor reduces the effect of electrical noise and spikes and increases the reliability of both hardware and software.

Protect your computer from unnecessary power problems, say 'No' to dirty power.



R.R.P. £15.50 including p.p.
Dealer enquiries welcome.

The Plug is available from dealers or direct from the manufacturer

FOR FURTHER INFORMATION CONTACT:

Power International Limited 2A Isambard Brunel Road, Portsmouth, Hampshire. PO1 2DU. Tel. (0705) 756715

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BUSINESS SOFTWARE	NET	INC. VAT
Access	162.00	186.30
Business Forecasting Model (Reqs. Visicalc)	69.00	79.35
Calcstar (CP/M) (80 column spread sheet)	69.00	79.35
dBase II (CP/M)	325.00	373.75
Data Star (CP/M) (powerful data entry)	122.00	140.30
Data Perfect	67.00	77.05
D.B. Master (version 3.02)	119.00	136.85
D.B. Master statistics	62.00	71.30
D.B. Master utilities (links with visi's)	62.00	71.30
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Multiplan (Microsofts superior spreadsheet)	155.00	178.25
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PFS Graph	68.00	78.20
PFS Report	53.00	60.95
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Visiplot	135.00	155.25
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Applewriter II	83.00	97.75
Executive Secretary	149.00	171.35
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Sensible Speller (new fast proof reader)	69.00	79.35
Sensible Speller (CP/M)	69.00	79.35
Screenwriter II (70 col w/out 80 col card)	75.00	86.26
Super Text 40/80	114.00	131.10
Word Handler (does not req. 80 col. card)	99.00	113.85
Zardax (40/80 & inc form letter)	139.00	159.85
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Epson RX-80 (100 cps tractor feed)	275.00	316.25
[illegible] (160 cps & prop. spacing)	399.00	458.85
Epson [illegible]-3 (100 cps & wide [illegible]	449.00	516.35
[illegible] Tally MT120 L (160 cps)	525.00	603.75
[illegible] Graphics Plotter	545.00	626.75
[illegible] (100 cps & prop. spacing)	339.00	389.85
[illegible]5 (25 cps daisy wheel)	599.00	688.85
[illegible] F10-40cps	1099.00	1263.85
[illegible] INTERFACE CARDS		
[illegible] Parallel	69.00	79.35
[illegible] Serial	75.00	86.25
[illegible] I/Face (7710A)	119.00	136.85
[illegible] Multifunction Card (inc real time Clock)	119.00	136.85
Digitek Printmaster (BASIC/CPM/PASCAL)	69.00	79.35
[illegible] + (Epson/Anadex/Cent/Nec)	98.00	112.70
IPB 16K (serial/parallel card & buffer)	129.00	148.35
MBP 16K (Epson 16K buffer)	96.00	110.40
[illegible]	95.00	109.25
80 COLUMN CARDS & ACCESSORIES		
[illegible] switch (for Videx Videoterm)	24.95	28.69
[illegible] (inc shift mod. & font editor)	127.00	146.05
[illegible] Enhancer II	83.00	95.45
[illegible] Inverse Eprom	18.45	21.22
[illegible] Utility Disc (inc font editor etc)	27.00	31.05
[illegible] Videoterm	175.00	201.25
[illegible] preboot disc (80 col with videx)	32.00	36.80
[illegible]-80 (incs softswitch & inverse)	185.00	212.75
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[illegible] Colour Card (excellent colour [illegible]	95.00	109.25
[illegible] R.G.B. Colour Card	88.00	92.00
[illegible] 12" Green Screen	105.00	120.75
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[illegible] Graphics System (Penguin)	65.00	74.75
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[illegible] Draw 3.3 (excellent graphic utility)	32.00	36.80
[illegible] (fast 3D utility plus music)	46.00	52.90
[illegible] Magician (Penguin)	39.00	44.85
[illegible] package Sublogic (detailed [illegible]	74.75	85.96
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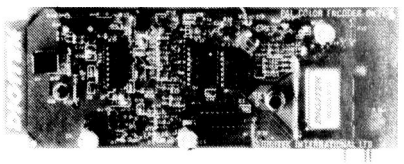
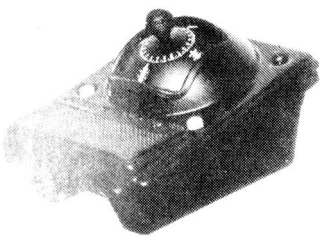
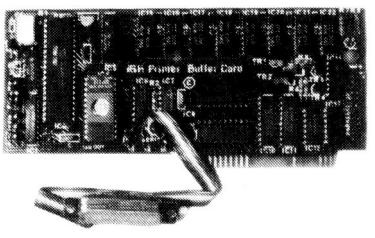
The Routine Machine (mach. lang routines)	45.00	51.75



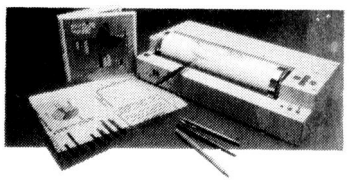
DIGITEK COLOURCARD
This amazing card gives high quality colour and includes a wide band modulator, simply plug in your TV or Pal monitor. £95.00 + VAT.



THE BIT STIK GRAPHICS SYSTEM
[illegible] smooth tracking hemisphere with [illegible] back pressure, and probably the [illegible] powerful Microcomputer graphics [illegible] available. £245 + VAT.



IPB-16K SERIAL/PARALLEL INTERFACE & BUFFER
Now you need only one interface card to support both your daisywheel and dot matrix printers plus the benefits of a 16K buffer to speed things along. £129 + VAT.



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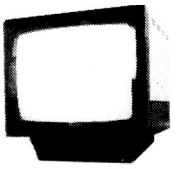
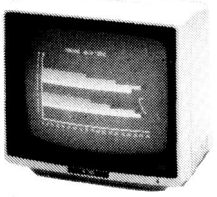
Create superb hardcopy graphics directly from your Apple at a fraction of the cost of most other systems. A4 size or transparencies. £545.00 + VAT.



MICROVITEC 14" COLOUR MONITOR
[illegible] offering a crystal clear display in [illegible] text, hi-res or low-res modes. It also [illegible] the following features, 16 text [illegible] b/grd colours, 80 column card [illegible] compatibility. A superb colour monitor for [illegible] + VAT.



12" KAGA MONITOR
Features 24 M/Hz bandwidth, giving a very clear display, and contained in a neat Apple compatible case. Green screen £105 + VAT.

PACE

0274 575973

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16K Ramcard Digitek	75.00	**86.25**
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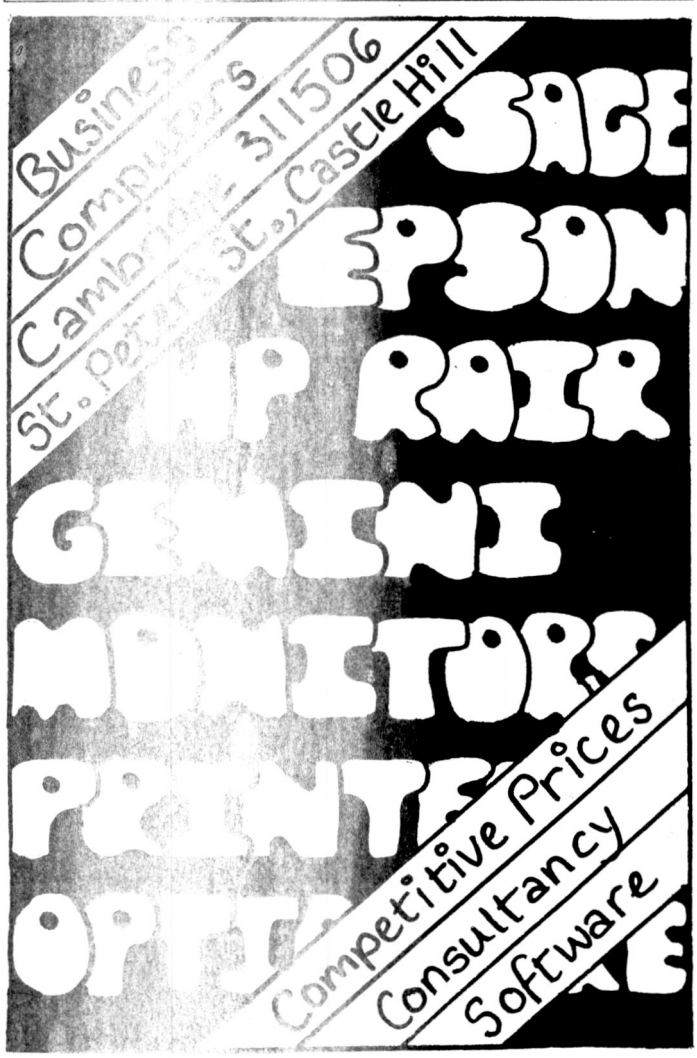

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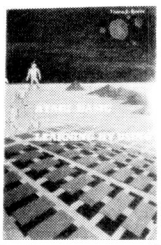



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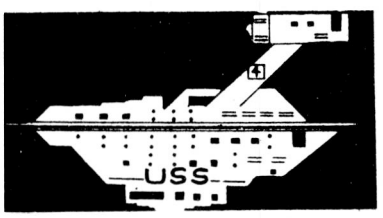

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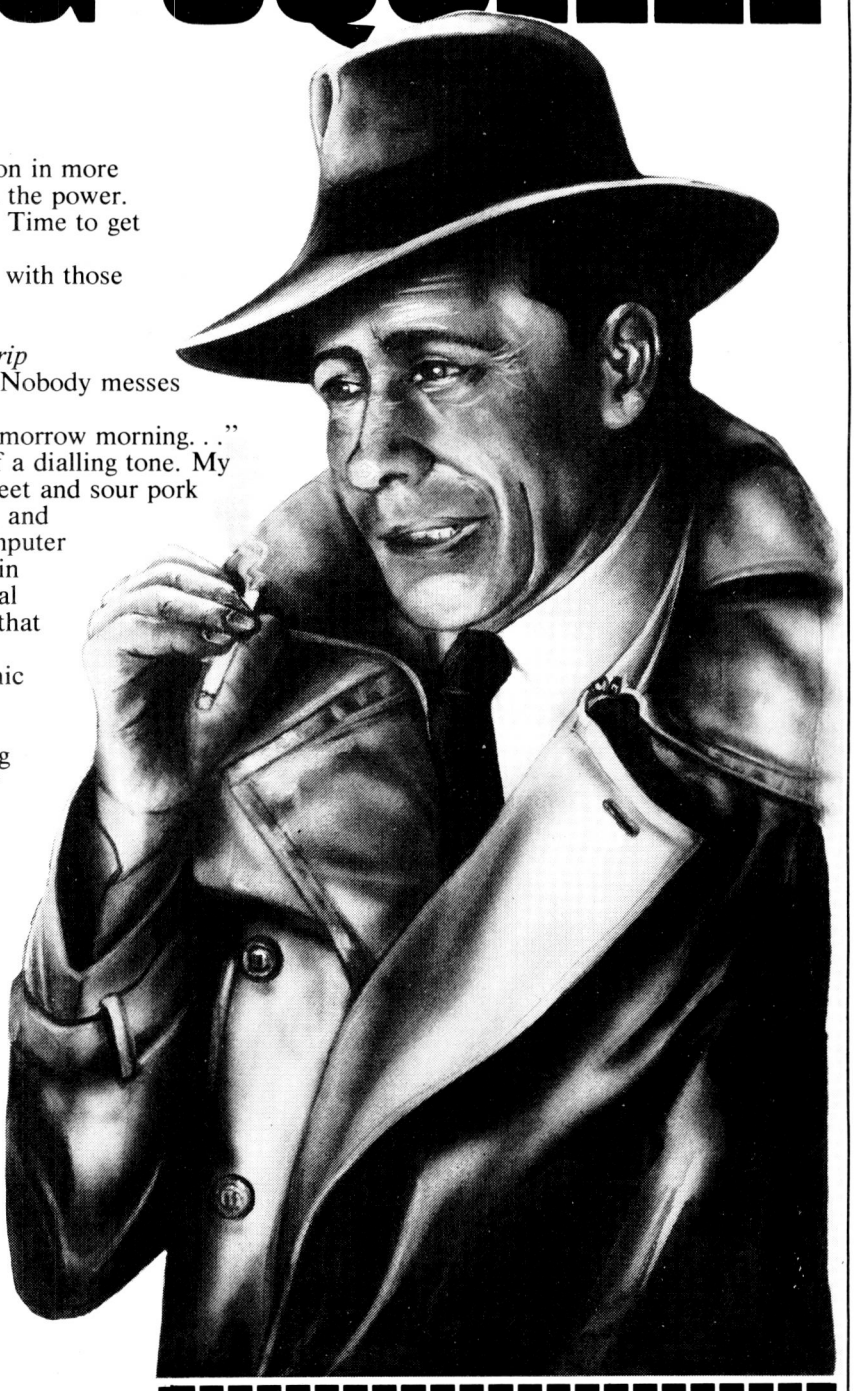

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"Take it easy," I said. "I'm on the case."

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Ten minutes later the first pricklings of panic ran up my spine. It had vanished. If only I'd ordered a Mark III *PCW* Binder to keep the copies in. Already I could imagine the roaring whine of the chain saw. . . maybe they'd only take a *few* fingers. . .



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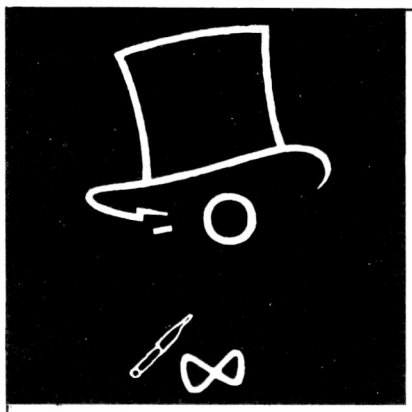

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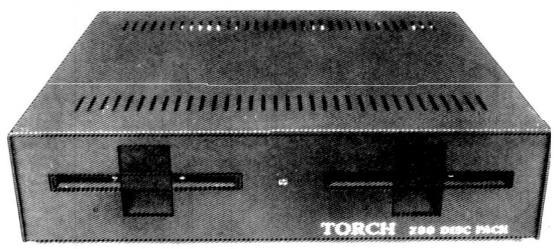

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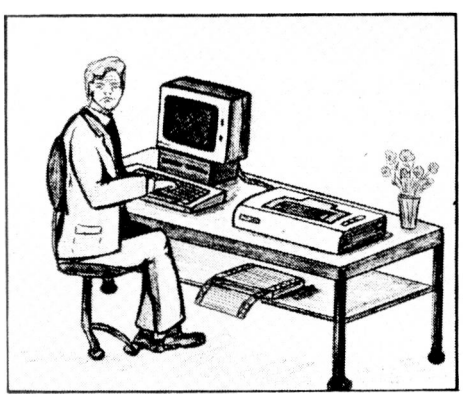

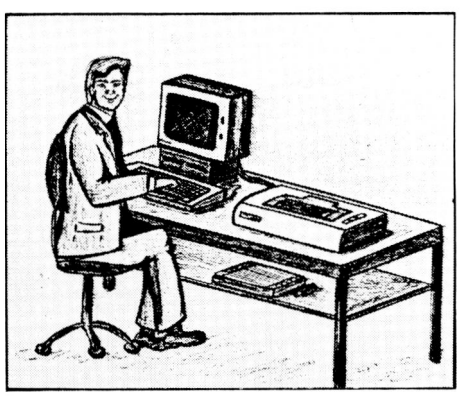

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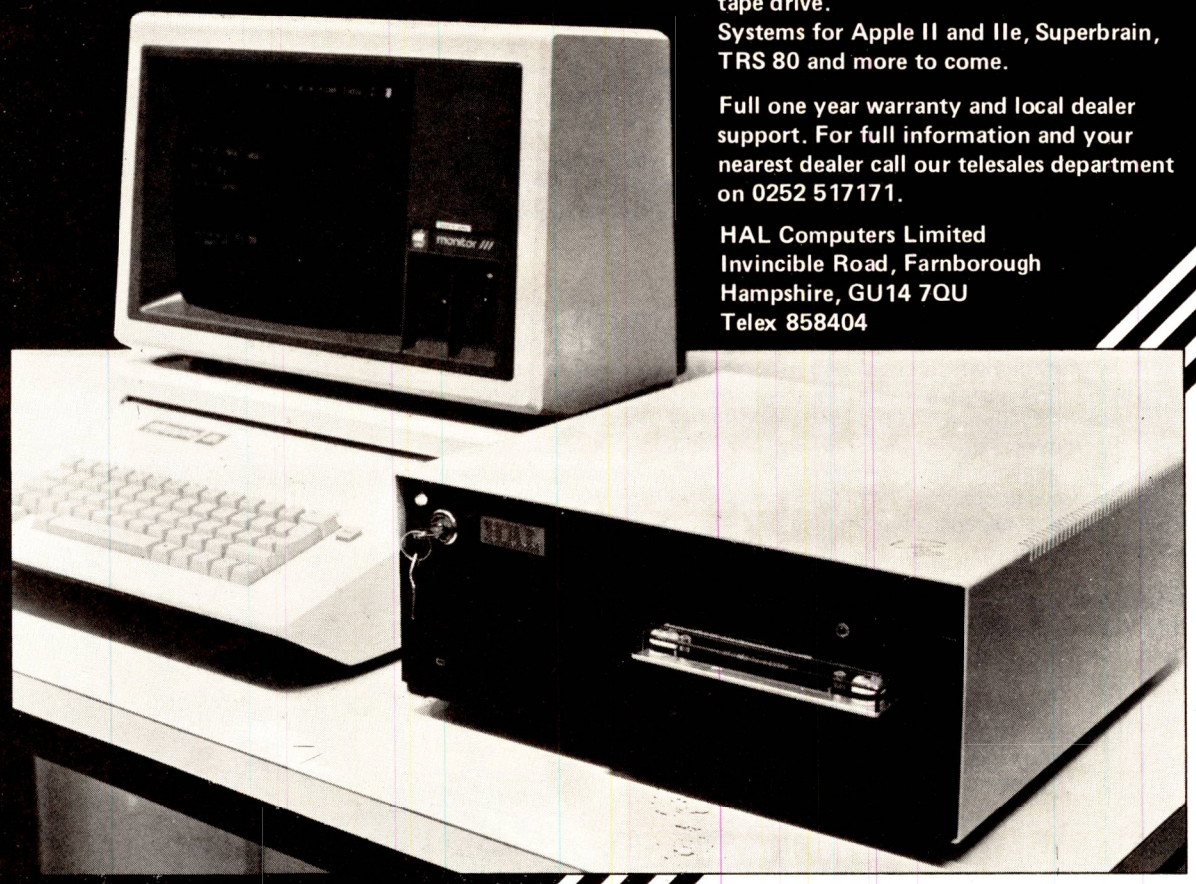

SO MUCH SPACE, WE'RE OUT OF THIS WORLD

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You have to kiss a lot of frogs before you find a prince

Buying the right computer system today is a difficult and drawn out process. And rightly so, even after the lengthiest decision making programme you could still end up with a frog. Unfortunately kissing frogs can give you warts - hidden costs like expensive service deals, extra peripherals, lack of software and training schemes that the salesman never seems to mention. More importantly, you may find that when the time comes to expand, either you can't do it or it proves to be an extremely expensive enterprise.

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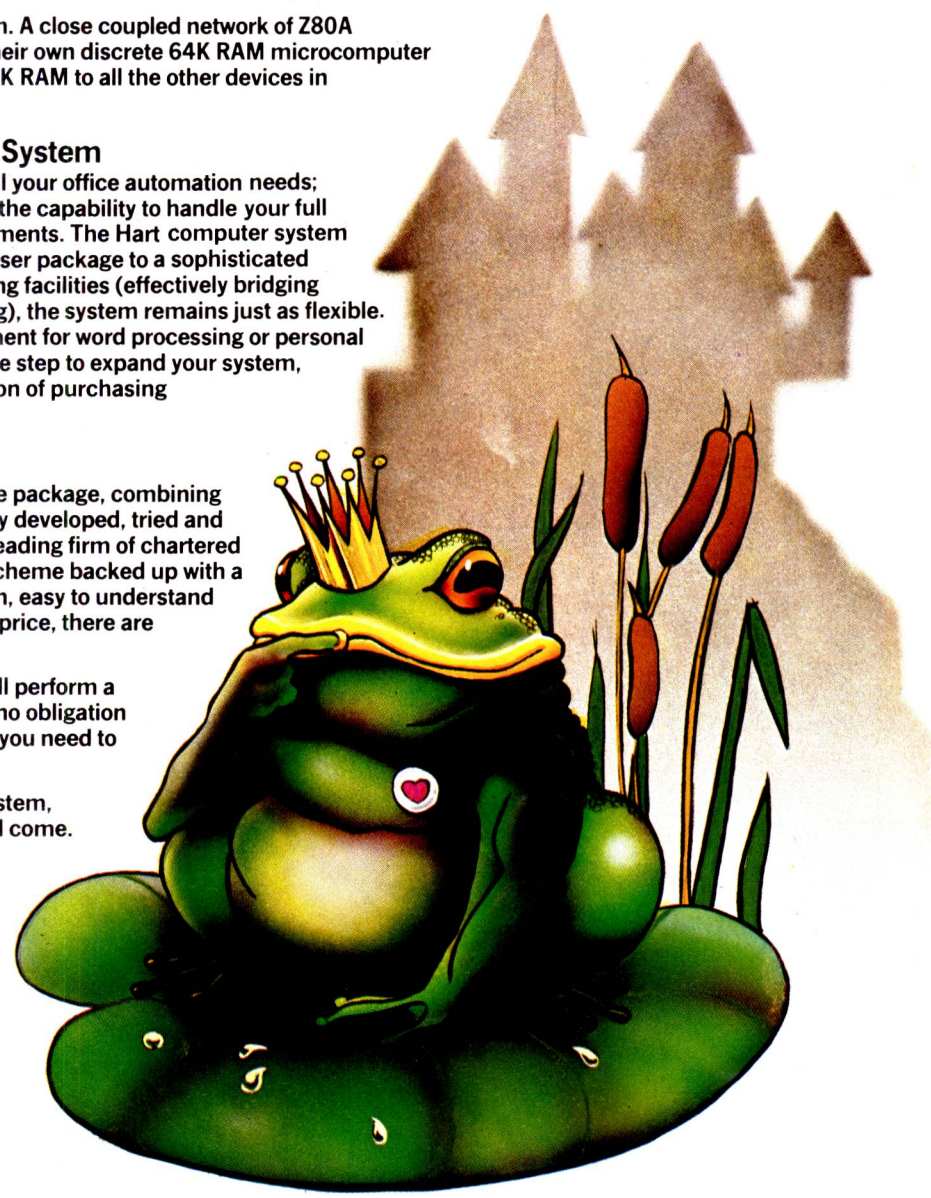

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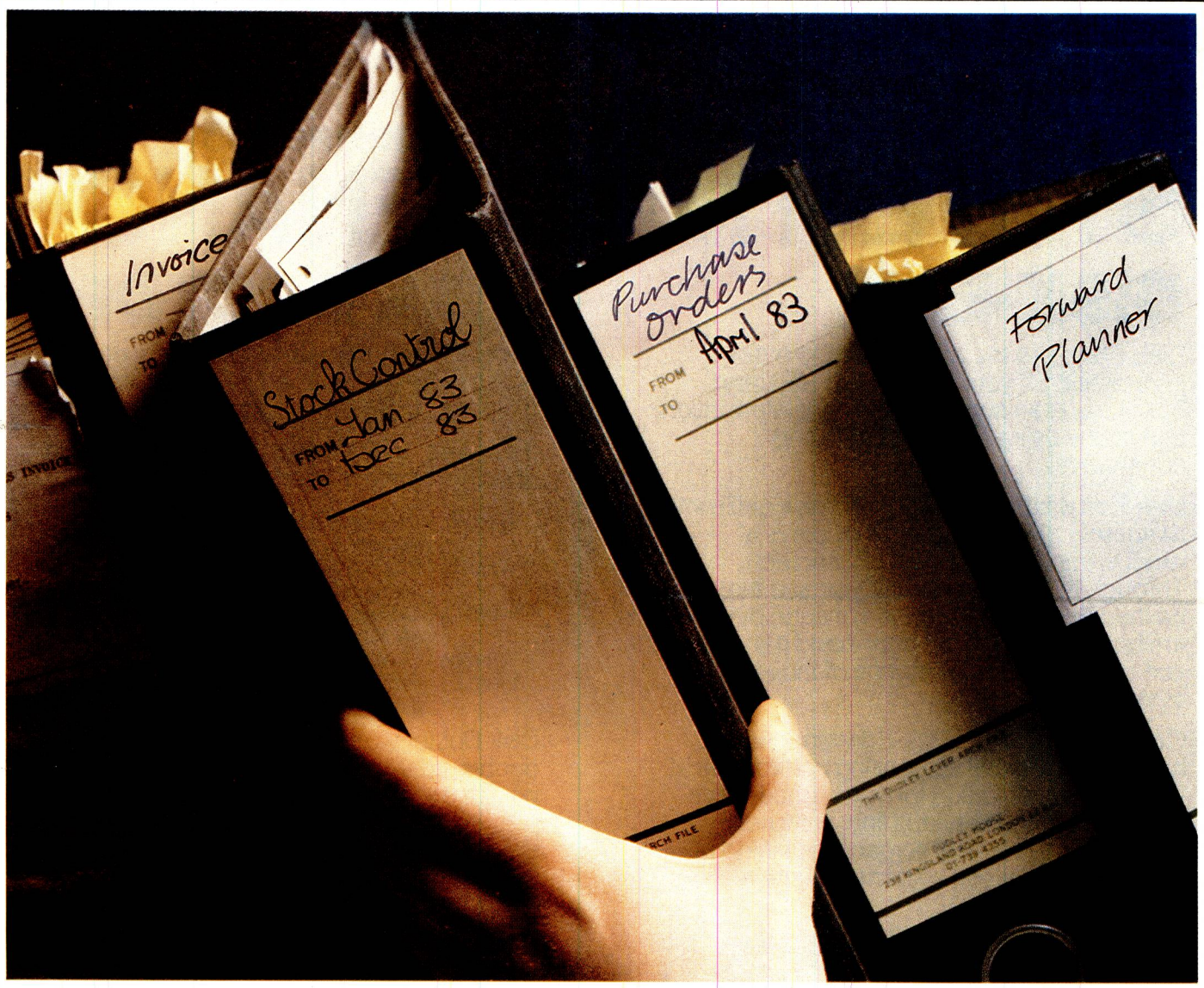

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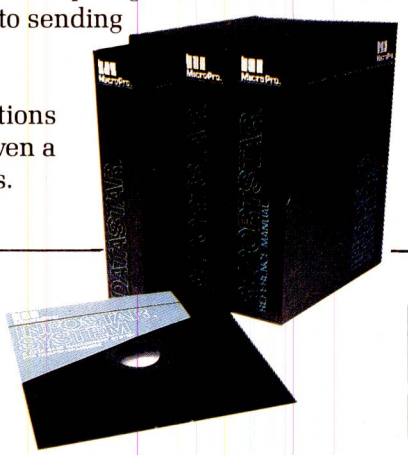

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Disk-Edit loads a segment of a disk or file into its internal memory buffer. It displays a window into that buffer on your screen. Through the left-hand pane you see the hexadecimal representation of each byte in the buffer. Through the right-hand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

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

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The areas of your computer which are tested include: Memory, Printer, Terminal, Disk, and CPU.

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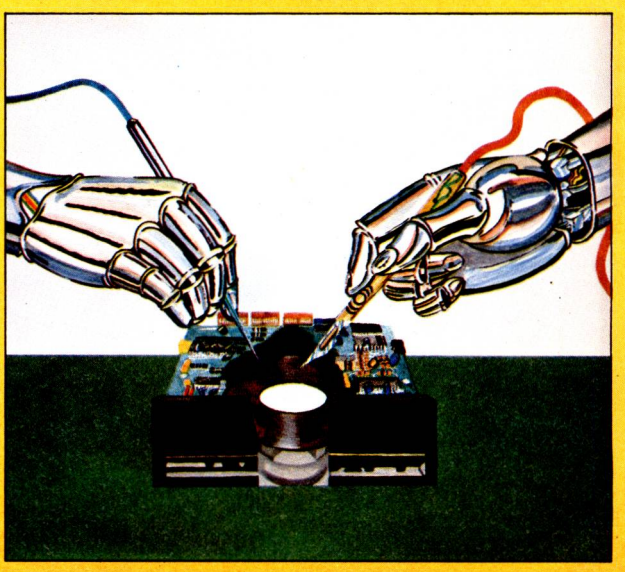
Ward D:	Un-erases files.
Ward E:	Displays a directory of recoverable erased files.

Disk Doctor was not designed for use with double sided or hard disks.



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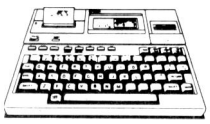

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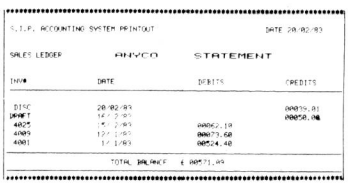

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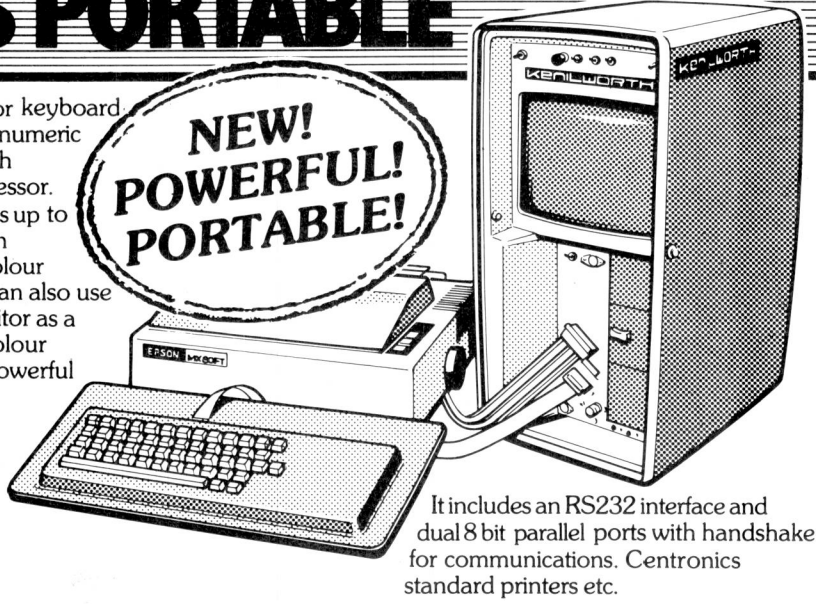

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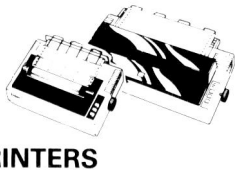

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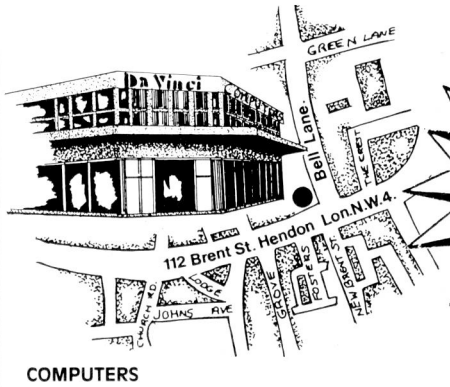

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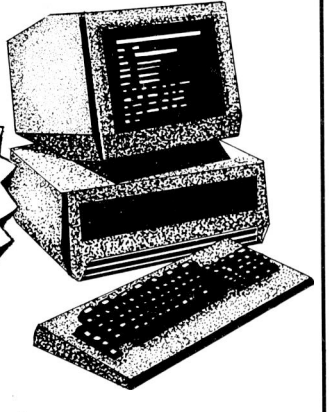

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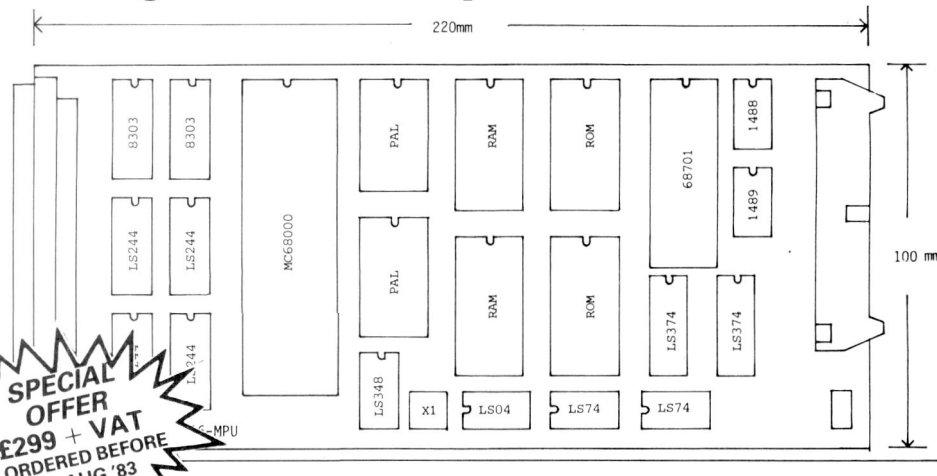

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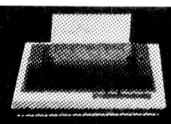

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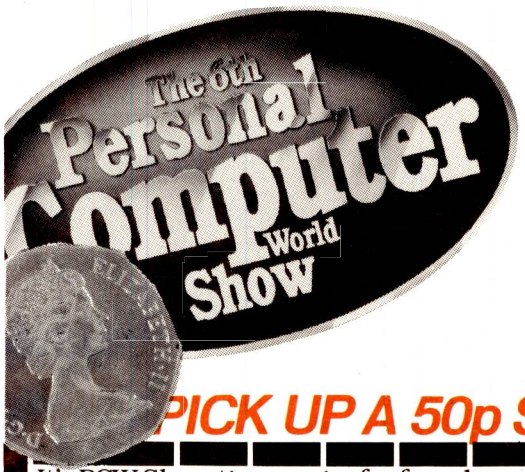

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If you already have a Disc interface fitted, it is easy to upgrade, you simple remove the DFS Eprom and replace it with the Amcom DFS Eprom, if not then it is possible to purchase an entire Disc interface kit (consists of 11 I.C.'s).

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* OPT3,n	Alters the number of tracks per disc to n
* OPT5,n	Sets the start address of the DFS buffer (see OPT7)
* OPT6,n	Provides control over which part of the file spec. will be displayed ie. only display directory and program length, or just display drive and load address etc
* OPT7,n	Sets the length of the DFS buffer
* SYS	Selects either Acorn mode or Extended mode

There is a built-in formatter which will format in either forty or eighty tracks in both modes of operation. This formatter also allows for user definable parameters to be included for the development of software protection.

With this disc filing system a user definable buffer can be used while compacting the disc. This will enable disc compacting to be carried out without overwriting any programme in memory. Alternatively a new disc may be formatted without any resident programme being overwritten.

This DFS also allows for the use of wildcard characters, using either the # symbol for a single wildcard and the * character for multiple wild characters. (e.g. CHAIN P* could be used to chain a programme called PRINTER as long as there are no other files whose names begin with P).

Has many friendly features such as assisting in transfer of cassette files to disc. This DFS is totally compatible with Econet etc., and is complete with a utilities disc and comprehensive manual. The utilities disc contains many useful programmes including printer screen dumps in all modes, including High Res. (Epson, NEC 8023 & GP 100A). It also has a nibble editor to scan discs, read data, edit them, and then write back to the disc.

Can be supplied either as the DFS, DISC and MANUAL alone at £34.00 inc VAT or as complete DISC INTERFACE KIT with full fitting instructions at £95 inc VAT.

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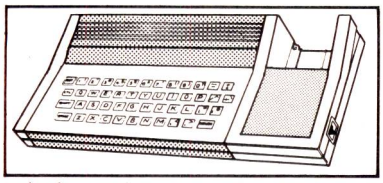

AQUARIUS: The brand new Aquarius Personal Computer is part of Mattel Electronics latest developments in advanced technology and offers full home computing facilities, as well as extensive game play, using a very wide range of plug in cartridges. Since Aquarius is a Mattel Electronics product, it benefits by the company's wide experience of producing high technology equipment, as well as their game programming expertise which is evident from the advanced games which have been produced for the Intellivision. Aquarius costs £79 and comes with microsoft basic built in. It is so simple to use that you'll be writing your first programs within minutes of taking the machine out of its box. You can even record the programs on your own cassette recorder at home, so you can use them again at a later date. Most available domestic tape recorders are compatible with the Aquarius.

A POWERFUL MACHINE: For all its simplicity, it is also very sophisticated. It has a Z80A processor and 8K of built in ROM as well as 4K of RAM, which is user expandable to 52K. It has a display of 40 x 24 characters, and a graphic resolution of 320 x 192 with a total character set of 256 (including the complete ASCII set with upper and lower case letters, numbers and additional graphic symbols). The keyboard has 49 full stroke moving keys, unlike some of the cheaper machines which have membrane keyboards. The size of the machine (excluding any of the additional peripherals), is 13" x 6" x 2".

PERIPHERALS: It is very easy to increase the capabilities of your Aquarius as all the peripherals plug straight into one another. You can add a Printer, a Modem, a Data Recorder, Mini Expander and other items. All of the peripherals are very easy to install and what is more, they're easy to use. But the best news of all is, they're easy to afford.

CPM OPERATING CAPABILITY: The Aquarius is capable of being expanded to 52K RAM and later in 1983 a disk drive will be available for it, with the commercial CPM business operating system. This will allow you access to one of the largest software libraries in the world, with literally hundreds of programs available for you to use.

CARTRIDGES: Various sophisticated programs will be launched on plug in cartridges such as a Visicalc type spreadsheet and a word processor. In addition there will be dozens of games and utilities and alternative languages such as Logo, which combined with the built in microsoft basic gives an unbeatable combination of high quality programming ability.

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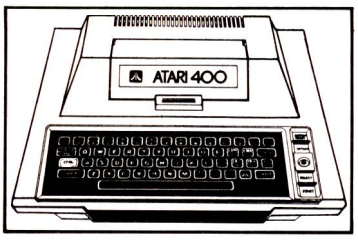

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SPECIFICATIONS: Both the Atari 400 and 800 can display in up to 16 colours, each with 16 intensities. They have four independent sound synthesizers for music tunes/game sounds, giving four octaves with variable volume and tone control on your T.V.'s speaker. The display graphics are of amazing quality, having a detailed resolution of 320 x 192, comprising 24 lines of 40 characters. Atari personal computers have a standard 10K ROM operating system. In addition the standard Atari 400 (£149) comes with 16K of RAM, and the expanded version with 48K (£198). The Atari 800 (£299) comes with 48K as standard. Both the 400 and 800 are now supplied with a FREE £40 Basic Programming Kit, which includes the Basic Programming Cartridge, as well as a 120 page Basic Reference Manual and the 184 page Self Teaching Manual by Bill Carris called 'Inside Atari Basic', so you can begin programming straight away, without buying any 'extras'. Even a mains plug is supplied!

OVER 500 PROGRAMS AVAILABLE: The Atari computers are supported by well over 500 programs available for your use, a larger selection than you will find on any other television game or home computer! The wide selection puts Atari way ahead of the competition. Just fill in the coupon and we will be pleased to send you a full price list which gives details of our range of software available for entertainment, home education, programming and home office use. We think you'll agree when we say it's quite impressive.

100 FREE PROGRAMS FROM SILICA SHOP: If you buy your Atari Home Computer from Silica Shop, you will recieve a FREE presentation pack of 6 cassettes, containing 100 programs including games, utilities and demonstrations. A 16 page booklet giving full details of all of these programs is available on request. If you have already purchased your computer elsewhere you can buy the set of 6 cassettes for £30. What's more, Silica Shop offer a two year guarantee on all computers as well as a FREE joystick. This adds up to a great offer that we believe can't be beaten or matched by any of our competitors.

ATARI 400 16K – £129.57+VAT=£149
ATARI 400 48K – £172.17+VAT=£198
ATARI 800 48K – £260.00+VAT=£299

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VIDEO GAMES

COLECOVISION



THE SYSTEM: The CBS Colecovision offers new standards in video game play. The excellent graphics are well implemented with arcade titles such as Zaxxon, Lady Bug, Gorf, Wizard of Wor, Carnival, Mouse Trap and the lovable Smurfs. The console comes supplied with a three screen arcade quality version of DONKEY KONG. Parker and other companies have also announced ranges of cartridges for Colecovision, to further enhance the wide range of quality titles available for this new television games machine.

THE CONSOLE: The CBS Colecovision video games system has advanced technology which produces superlative graphics resolution and excellent sound effects. The styling of the console and hand controllers has been carefully researched; the console is designed to complement modern hi-tech equipment, and has clear features for easy operation. The hand controllers allow fingertip control via the 8 direction joystick, and feature 2 independent fire buttons. The push button keyboard is used for game selection and for game control with some cartridges. The hand controllers are detachable and are connected to six feet of telephone coil cable, storing neatly away in the console when not in use.

ATARI EXPANSION MODULE: The Atari converter module allows Atari VCS software cartridges to be played on the Colecovision console, allowing owners the freedom to purchase from the extensive range of Atari compatible cartridges. It also means that existing Atari owners can buy the CBS Colecovision games system without discarding their software library. Silica Shop offer part exchange facilities if you wish to upgrade.

TURBO EXPANSION MODULE: The Turbo Driver Expansion Module allows you to actually drive the vehicle that appears on your T.V. screen. The module consists of a steering wheel, dashboard and accelerator pedal. One hand controller is mounted on the dashboard to provide a gear change unit. The module comes complete with a Turbo Driver cartridge, the first of several cartridges to make use of the module, which provides all the action of sitting in the driving seat. This facility is unique to CBS Colecovision.

HOME COMPUTER EXPANSION MODULE: The Home Computer Module scheduled for late 1983, allows conversion of the games unit into a sophisticated Home Computer. This flexibility of design is an important feature of the CBS Colecovision System.

COLECOVISION - £127.82 + VAT = £147

£147

VECTREX



THE SYSTEM: Vectrex is a totally unique Home Arcade System, which has been exclusively designed and engineered to duplicate real arcade game play. Complete with its own monitor display, Vectrex won't cause any arguments over the use of the family's television because it has its own built in screen.

THE SCREEN: Vectrex does not use ordinary display techniques, instead it uses vector scanning to control the images on the screen. With this scanning method, the gun only updates the area of the screen that has changed, whereas a normal T.V. re-transmits the ENTIRE screen 50 times a minute. It is this that gives Vectrex its speed, and means that very little computer power is required for screen control, and the results provide very fast responding and clear images. These 'Vector Graphics' are used in several arcade games such as Asteroids and Battlezone, to give you incredibly high resolution and quality. Vectrex brings all of this from the arcade right into your living room. The Vectrex screen is capable of displaying 80 columns by 40 lines, which is significant to the extensive developments planned for the system.

EXCITING SOUNDS AND ELECTRONICS: Vectrex has an advanced microprocessor with more speed and power and exciting effects than many home video games systems.

REAL ARCADE CONTROLS: Vectrex has a unique control panel, similar to those used in many real arcade games, with 4 concave action buttons and a full 360° self centering joystick. This control panel has a 4 foot detachable cord for maximum player freedom.

REAL ARCADE GRAPHICS: Vectrex has its own 9 inch vertical screen and unlike a conventional T.V. screen, uses advanced display technology to achieve brilliant, high resolution imagery and superb game play never before possible. The Vectrex display provides special effects too, such as 3-D rotation and zooming in and out, which a regular T.V. cannot match. Using a black and white monitor, each Vectrex game comes supplied with its own coloured plastic screen overlay to add to the excitement of game play. The range of Vectrex cartridges (£21.95 each), gives a good selection of arcade games such as Berzerk, Scramble, Rip-Off and Bomber Attack. Vectrex comes complete with a fast paced 'Minestorm' game built into memory.

VECTREX: Vectrex has an advanced state-of-the-art microprocessor with more speed than other T.V. games.

VECTREX – £129.57 + VAT = £149.00

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WHO ARE SILICA SHOP?

Silica Shop are one of the leading specialist suppliers of Video Games & Personal Computers. We consider that our service, to those who already own or to those who are interested in any products in our range, cannot be matched by any other supplier. Just look at what we have to offer:

* **SHOP DEMONSTRATION FACILITIES** - we provide full demonstration facilities at our shop in Sidcup, so that you can get 'hands on' experience of our range.
* **SHOP OPENING HOURS** - we are open from Monday to Saturday 9 am - 5.30 pm, but close at 1 pm on Thursday's and 8pm on Friday's.
* **MAIL ORDER** - we are a specialist mail order company and are able to supply goods direct to your door at no extra cost.
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* **2 YEAR GUARANTEE** - we offer a 1 year extension on some manufacturers 12 month guarantee, including Atari Personal Computers.
* **VIDEO GAMES AND COMPUTER CLUBS** - we offer a full information service on all video games and computers in our range. Advanced information on many new developments is often included, so you are always kept informed. We now issue regular newsletters on software releases so make sure that you join our club.
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ATARI

ATARI VCS (2600) — THE NO 1 BRAND LEADER IN THE U.K.

ATARI: The Atari Video Computer System known as the Atari VCS or the 2600 has now become the T.V. game brand leader. In the U.K. there are over 700,000 owners of the VCS with access to a range of over 200 different plug in cartridges, each having a multitude of different variations and difficulty levels. Every system comes complete with the main console, two individual joystick controllers, a pair of paddle controllers, aerial splitter, mains adaptor and a 27 game Combat cartridge. It gives you bright crisp graphics, realistic sound effects and even specially designed circuits for the protection of your Television Set.

SECONDHAND GAMES: We currently have several secondhand Atari VCS units in stock which we are selling for only £49 (inc VAT). This price includes the Console, with Combat Cartridge and all the accessories, as well as a 12 month guarantee. We also have stocks of several secondhand cartridges many at half price (all with 12 months guarantee). We will normally buy back secondhand units and cartridges at one third of our standard price. **£49**

EXTENSIVE CARTRIDGE RANGE: The Atari VCS is so popular that in addition to Atari's own cartridges, there are over 150 compatible cartridges, produced by at least a dozen different third party manufacturers. Silica Shop has one of the largest cartridge selections available in the U.K. Our range of over 200 titles (printed either side of this column), includes items in stock now, as well as many of the new releases for later in 1983.

SILICA ATARI CLUB: Silica Shop has over 20,000 Atari VCS club members registered on our computer. As a specialist company we are able to obtain advance information about new developments and send detailed catalogues to all of our club members, enabling them to evaluate new products before they buy. This is a totally FREE service, to receive your copies complete the coupon below.

SERVICE CENTRE: Atari International (UK) Inc has recently appointed Silica Shop as an authorised Atari Service Centre. This means that we can now service your Atari VCS or 400/800 (under guarantee if applicable), whether or not you purchased it from us.

VCS COMPUTER KEYBOARD: A keyboard will soon be launched to convert the VCS into a fully programmable home computer. For further details, join our club by completing the coupon below. We will then let you know when further information is available.

STARPATH SUPERCHARGER: The supercharger plugs into the cartridge socket of your VCS and expands its RAM almost 50 fold, from 128 to 6,272 bytes. This increased memory adds vivid high resolution graphics capabilities and significantly lengthens the game playing time. Supercharger has a range of multi-load games (at £19.45 each), these offer the facility to play a game in several distinct parts (great for adventures), the next section being loaded when you have completed the previous one, thus enhancing the game play. For further information please complete the coupon below. **£79**

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ACCESSORIES

We stock a wide range of accessories for the Atari VCS and 400/800 personal computers. The same accessories can be used on the Commodore VIC range of computers. The Wico range can also be used with the Texas Instruments computers on purchasing a special adaptor. To give you an idea of the range available, just take a look at the following list:

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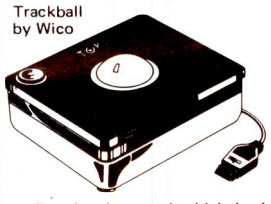

LE STICK: A mercury filled joystick specially made for one handed operation, with thumb fire button.

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STARFIGHTER: Neat and compact with a small direction stick. Metal interior for added strength.

VIDEO COMMAND: With a tapered handle, this joystick is for one handed use. It has a directional control which is similar to a jet fighter joystick.

WICO RED-BALL: An arcade type joystick with a red ball handle, it features 2 fire button locations, one at the base and one on the stick. It comes supplied with 4 grip pads for easier table top use.

WICO STRAIGHT - STICK: The main feature of this joystick is its arcade style, bat handle grip. It also has 2 fire buttons. Four grip pads included for table top use.

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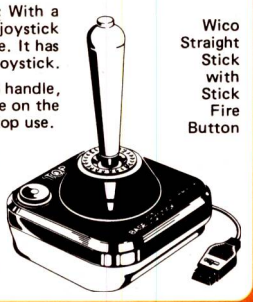
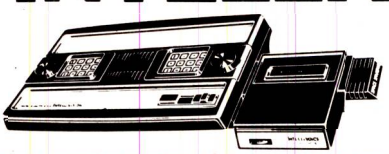


Wico Straight Stick with Stick Fire Button

MATTEL INTELLIVISION



MATTEL INTELLIVISION: The Mattel games unit is a most versatile T.V. game which offers 3-D graphics quality for only £98. Each cartridge comes with 2 overlays which fit over the unique hand controller giving easy directions for game play. Using the handset's control disc, objects can be moved accurately in 16 directions giving a realistic simulation of lifelike movement.

VOICE SYNTHESIS: The Intellivoice unit, price £49, is used with special cartridges where high quality synthesised male and female voices feature as part of the game play.

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In a fast moving market like video games, it is difficult to keep up to date with all the developments that take place. With new programmes and accessories being introduced at a fast rate by several different manufacturers, it is impossible to get all the information you require from one manufacturer alone. It is for this reason, that we have set up owners clubs for the more popular video games and home computers, to keep you fully up to date with what is going on with your particular machine. As far as we know, Silica Shop are the only company to offer such clubs, but that is not surprising since we are the specialists. We currently have **FREE** clubs for the **Atari VCS, Atari 400/800** home computers, and **Mattel Intellivision.** Soon we will have clubs for **Colecovision, Aquarius** and **Vectrex.** So if you own one of these machines, fill in the coupon opposite, and we will enrol you **FREE OF CHARGE** in the club relevant to your computer or video game.

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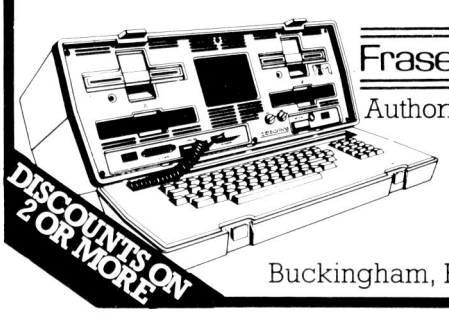

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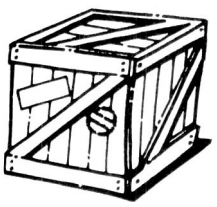

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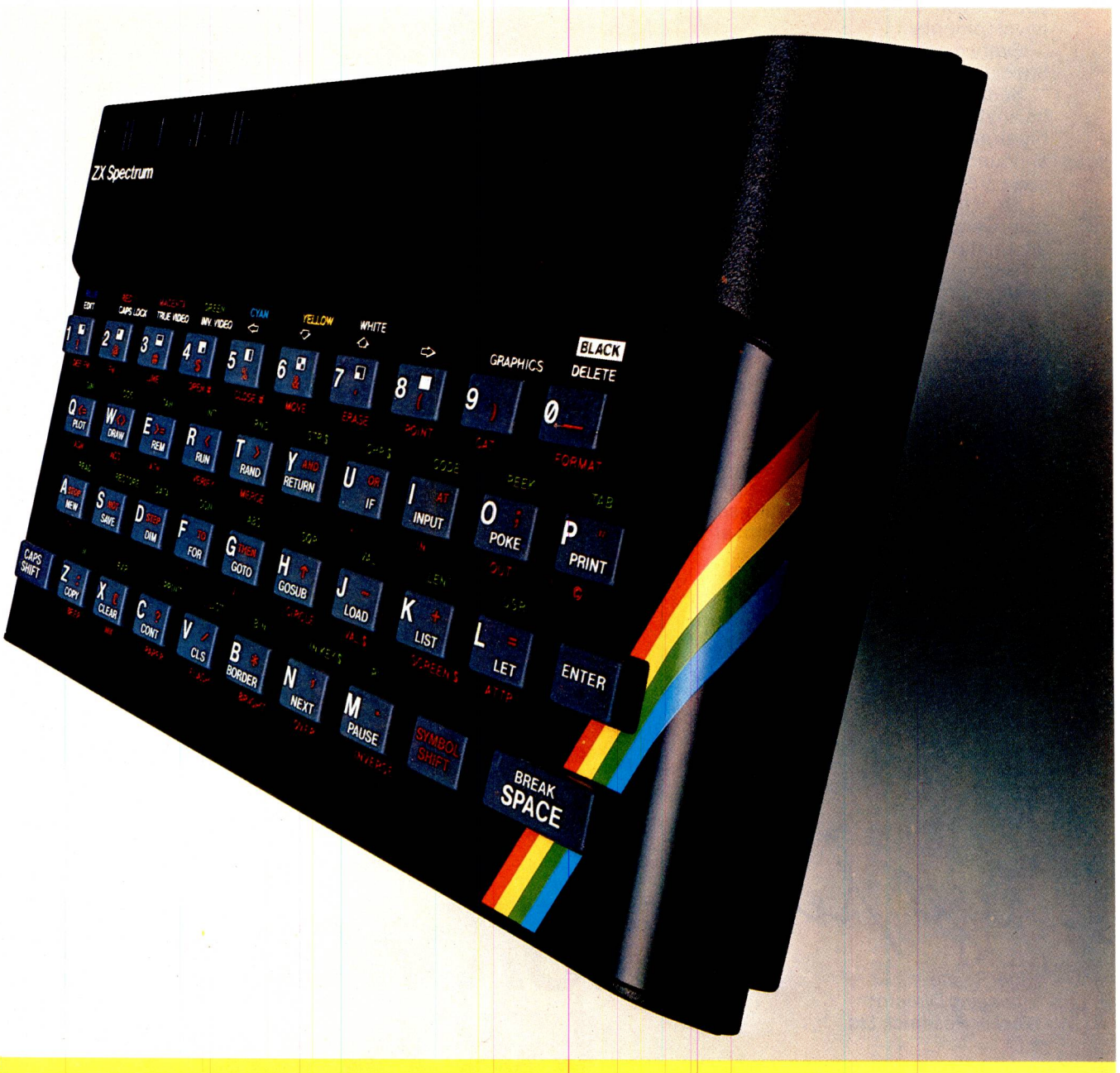


Inside...
Latest prices round-up...
Latest software...
Order form...

Introduction

One thing's certain about the Sinclair world – there's never a dull moment.

Every month sees new software and new hardware, produced by Sinclair enthusiasts, or produced by Sinclair itself.

The magazines do a fantastic job of keeping you up to date with the input of enthusiasts. We want to keep you in touch with Sinclair's own developments.

Every month, there'll be a Sinclair Special in this magazine.

Sometimes, inevitably, there won't be anything new to say – we want to break away from the breathless announcements of hardware and software you just can't buy.

But when something new *is* available, we want you to have accurate information – fast. You'll find it here.

This month, we're giving you the latest information on the recommended retail prices of Sinclair equipment. They're *our* prices, and you may well find things cheaper (or dearer) in the shops. If they're cheaper – terrific! Snap them up. Note, however, that from us the ZX81 is down to £39.95.

We're also announcing six superb new Sinclair cassettes for the Spectrum, and three more which make full use of the ZX81. There's an order form at the back of this Special.

Next month... but there, next month is another story! Watch (as they say) this space.

Nigel Searle

Nigel Searle.
Managing Director,
Sinclair Research Ltd.

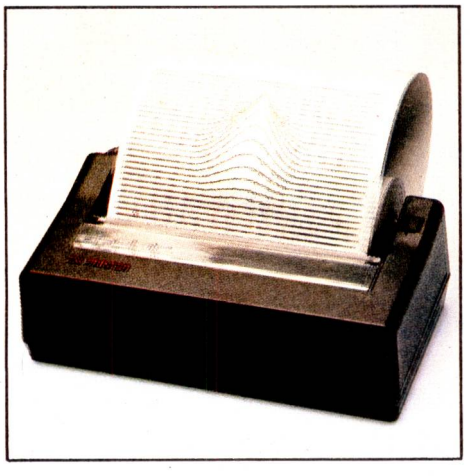
Spectrum – latest recommended retail prices.

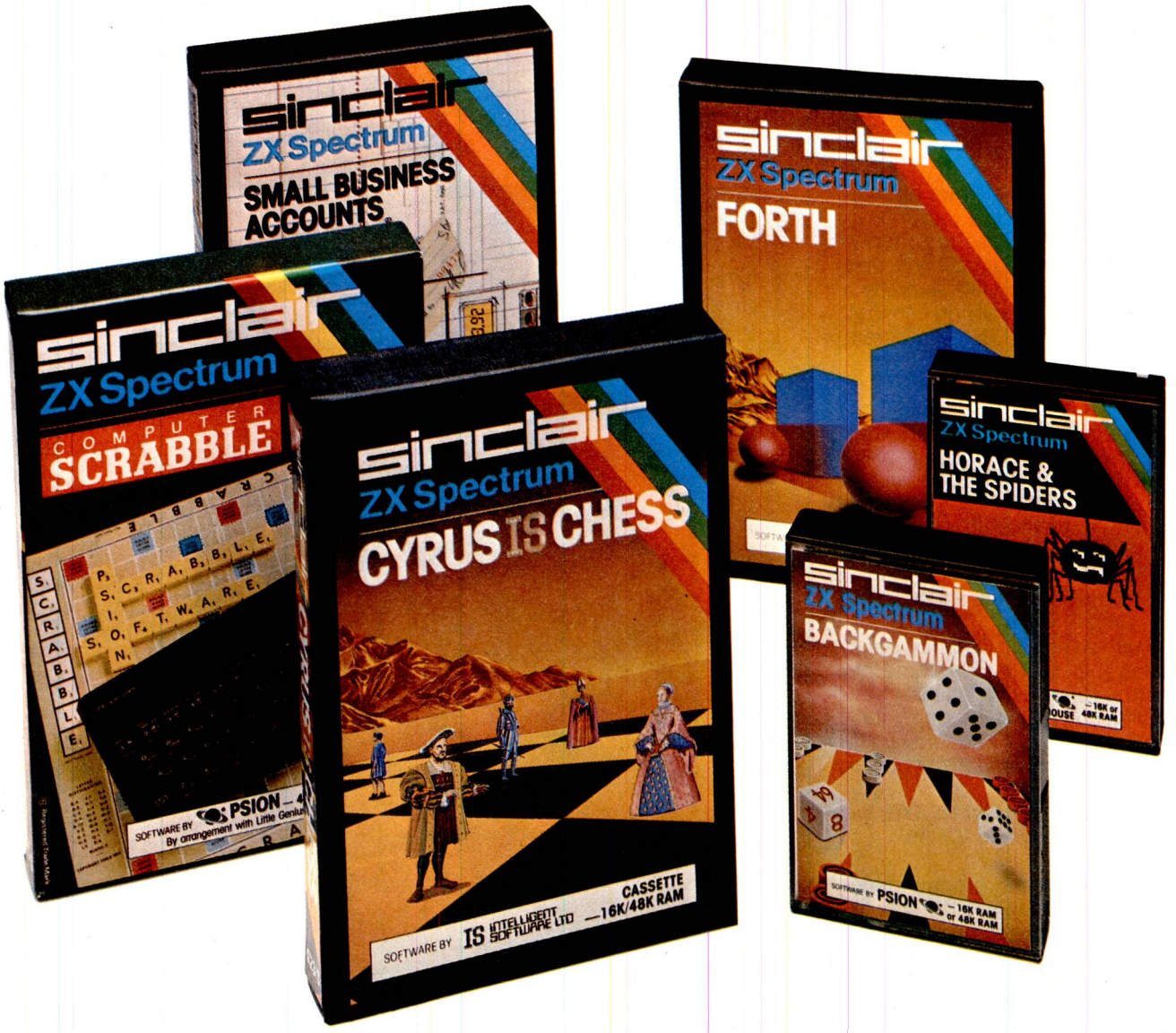


16K was £125.00
16K now £99.95

48K was £175.00
48K now £129.95

ZX Printer was £59.95 *ZX Printer now £39.95*
ZX81 was £49.95 *ZX81 now £39.95*





Six new ways to make more of your Spectrum.

Take a look at these brand-new titles. Each is an outstanding new program using the full potential of the Spectrum, for games with stunningly animated graphics, for strategies of fiendish cunning, for masterly applications of computing capability...

Cyrus-IS-Chess Based on the Cyrus Program, which won the 2nd European Microcomputer Chess Championship *and* trounced the previously unbeaten Cray Blitz machine. With 8 playing levels, cursor piece-movement, replay and 'take-back' facilities, plus two-player option. The 48K version has many additional features including an extensive library of chess openings. For 16K or 48K RAM Spectrum.

Horace and the Spiders Make your way with Horace to the House of Spiders, armed only with a limited supply of anti-spider-bite serum. In the house, destroy the webs before the spiders can repair them. Then destroy the spiders, before *they* destroy Horace! Undoubtedly the creepiest Horace program ever produced! For 16K or 48K RAM Spectrum.

Computer Scrabble The famous board game, on-screen – with the whole board on view! A huge vocabulary of over 11,000 words. Full-size letter tiles, four skill levels – the highest of which is virtually unbeatable. For 1 to 4 players. For 48K RAM Spectrum.
(SCRABBLE trademark and copyright licensed by Scrabble Schutzrechte und Handels GmbH – a J.W. Spear and Sons PLC subsidiary.)

Backgammon A fast, exciting program, with traditional board display, rolling dice and doubling cube. Four skill levels. For experts – or beginners. (Rules are included – it's the quickest way to learn the game.) For 16K or 48K RAM Spectrum.

FORTH Learn a new programming language, as simple as BASIC, but with the speed of machine code. Complete with Editor and User manual. For 48K RAM Spectrum.

Small Business Accounts Speeds and simplifies accounting work, produces Balance Sheets, Profit and Loss information *and* VAT returns. Complete with User manual. For 48K RAM Spectrum.

Overleaf – your Sinclair order form.

Three new ways to get the best out of your ZX81.

The range of Sinclair software for the ZX81 continues to grow.

These three new cassettes offer two totally different challenges to you and your ZX81. The games – like so many ZX81 games today – really do use the ZX81's capability. The FORTH program is a fascinating extension of your own computer understanding.

Sabotage Defender or attacker? The choice is yours in this exciting game.

Be the Guard and defend the randomly placed boxes of ammunition inside the compound – or be the Sabateur and attack the ammunition!

Written by Macronics for a ZX81 with 16K RAM. Cassette price: £4.95.

City Patrol You are the Commander of a laser-firing ship. Your task is to intercept and destroy alien suicide ships descending on your city. Judge your rating as Commander by how many aliens you destroy and how much of your city survives.

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	ZX Spectrum – 16K	3002	99.95	
	ZX 81 (including 1.2A Mains Adaptor)	1003	39.95	
	16K RAM pack for ZX81	1010	29.95	
	ZX Printer	1014	39.95	
	1.2A Mains Adaptor, for use with ZX81 computer/ZX Printer combination (only required if you have an early ZX81 with 0.7A Adaptor)	1002	7.95	
	Printer paper (pack of 5 rolls)	1008	11.95	
	Postage and packing: orders under £90	0028	2.95	
	orders over £90	0029	4.95	
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Section B: software purchase

Qty	Cassette	Code	Item Price £	Total £
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	G24/S:Horace & the Spiders	4022	5.95	
	G25/S:Scrabble	4024	15.95	
	L1 /S:FORTH	4400	14.95	
	B6 /S:Small Business Accounts	4605	12.95	
	FOR ZX81			
	G25: Sabotage	2124	4.95	
	G24: City Patrol	2123	4.95	
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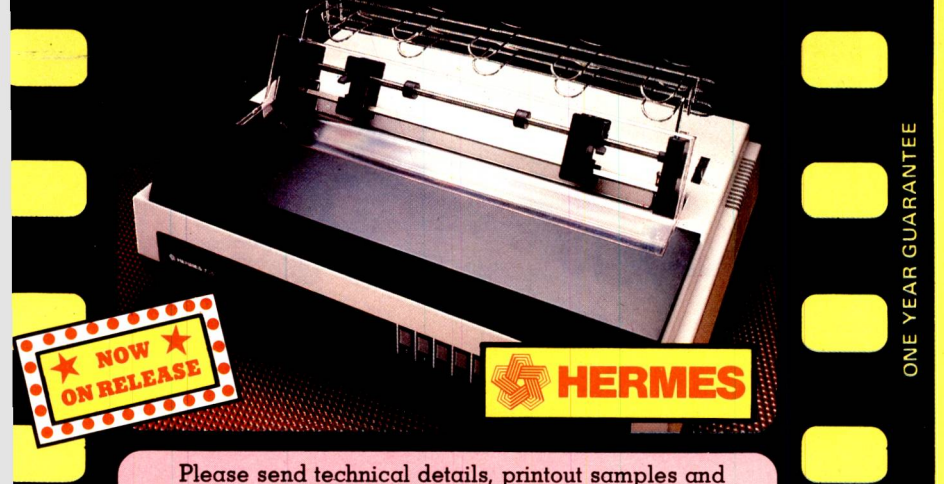

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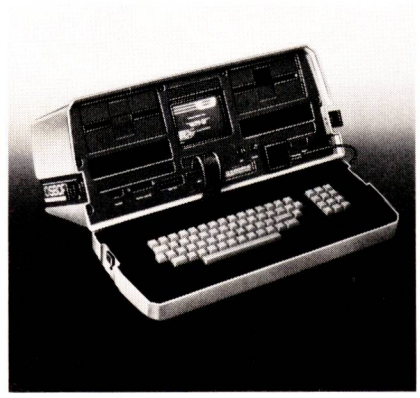

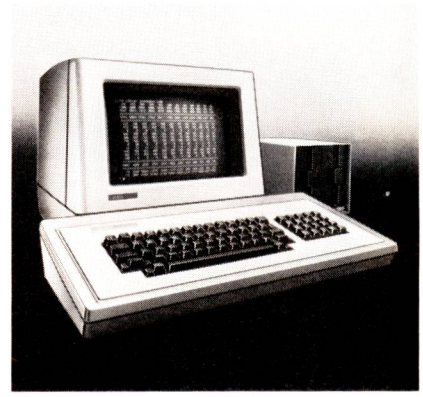

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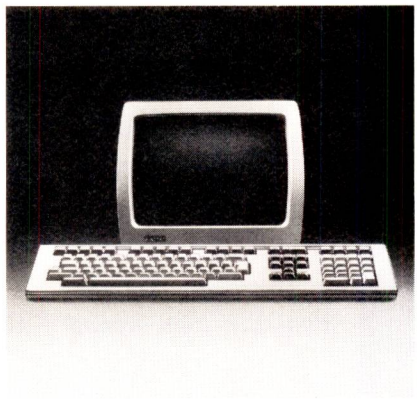





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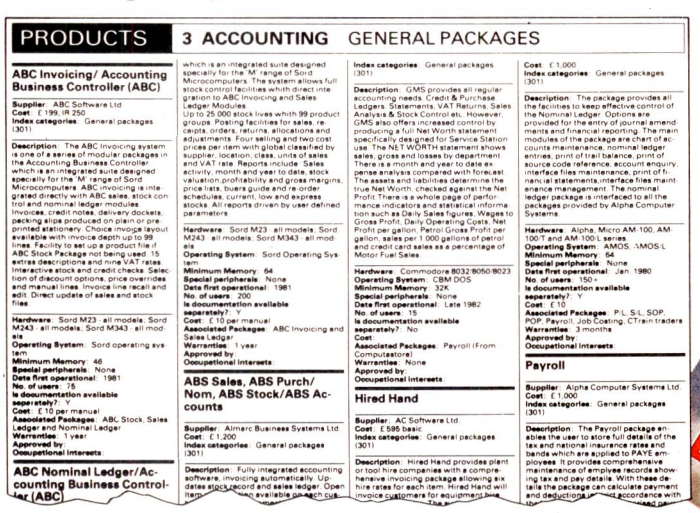

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Hardware: Sord M23 - all models; Sord M243 - all models; Sord M343 - all models
Operating System: Sord operating system.
Minimum Memory: 48
Special peripherals: None
Date first operational: 1981
No. of users: 75
Is documentation available seperately?: Y
Cost: £10 per manual
Associated Packages: ABC Stock, Sales Ledger and Nominal Ledger
Warranties: 1 year
Approved by:
Occupational interests:

ABC Nominal Ledger/Accounting Business Controller (ABC)

which is an integrated suite designed specially for the 'M' range of Sord Microcomputers. The system allows full stock control facilities whith direct integration to ABC Invoicing and Sales Ledger Modules.
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Hardware: Sord M23 - all models; Sord M243 - all models; Sord M343 - all models
Operating System: Sord Operating System
Minimum Memory: 64
Special peripherals: None
Date first operational: 1981
No. of users: 200
Is documentation available seperately?: Y
Cost: £10 per manual
Associated Packages: ABC Invoicing and Sales Ledger
Warranties: 1 year
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ABS Sales, ABS Purch/ Nom, ABS Stock/ABS Accounts

Supplier: Almarc Business Systems Ltd
Cost: £1,200
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Description: Fully integrated accounting software, invoicing automatically. Updates stock record and sales ledger. Open item

Index categories: General packages (301)

Description: GMS provides all regular accounting needs. Credit & Purchase Ledgers, Statements, VAT Returns, Sales Analysis & Stock Control etc. However, GMS also offers increased control by producing a full Net Worth statement specifically designed for Service Station use. The NET WORTH statement shows sales, gross and losses by department. There is a month and year to date expense analysis compared with forecast. The assets and liabilities determine the true Net Worth, checked against the Net Profit. There is a whole page of performance indicators and statistical information such as Daily Sales figures, Wages to Gross Profit, Daily Operating Costs, Net Profit per gallon, Petrol Gross Profit per gallon, sales per 1,000 gallons of petrol and credit card sales as a percentage of Motor Fuel Sales.

Hardware: Commodore 8032/8050/8023
Operating System: CBM DOS
Minimum Memory: 32K
Special peripherals: None
Date first operational: Late 1982
No. of users: 15
Is documentation available seperately?: No
Cost:
Associated Packages: Payroll (From Computastore)
Warranties: None
Approved by:
Occupational interests:

Hired Hand

Supplier: AC Software Ltd.
Cost: £595 basic
Index categories: General packages (301)

Description: Hired Hand provides plant or tool hire companies with a comprehensive invoicing package allowing six hire rates for each item. Hired Hand will invoice customers for equipment hire

Cost: £1,000
Index categories: General packages (301)

Description: The package provides all the facilities to keep effective control of the Nominal Ledger. Options are provided for the entry of journal amendments and financial reporting. The main modules of the package are chart of accounts maintenance, nominal ledger entries, print of trail balance, print of source code reference, account enquiry, interface files maintenance, print of financial statements, interface files maintenance management. The nominal ledger package is interfaced to all the packages provided by Alpha Computer Systems.

Hardware: Alpha; Micro AM-100, AM-100 T and AM-100 L series
Operating System: AMOS; AMOS/L
Minimum Memory: 64
Special peripherals: None
Date first operational: Jan. 1980
No. of users: 150+
Is documentation available seperately?: Y
Cost: £10
Associated Packages: P/L, S/L, SOP, POP, Payroll, Job Costing, CTrain traders
Warranties: 3 months
Approved by:
Occupational interests:

Payroll

Supplier: Alpha Computer Systems Ltd.
Cost: £1,000
Index categories: General packages (301)

Description: The Payroll package enables the user to store full details of the tax and national insurance rates and bands which are applied to PAYE employees. It provides comprehensive maintenance of employee records showing tax and pay details. With these details the package can calculate payment and deductions [illegible] accordance with

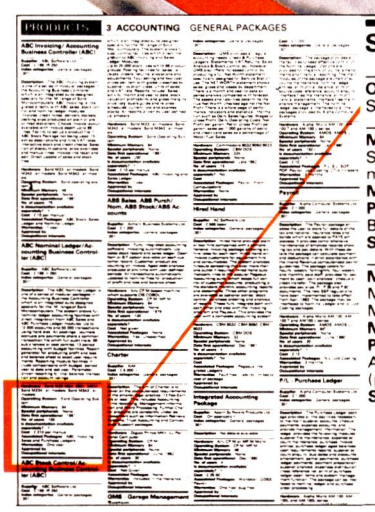
Finding the right package

A glance at our twelve main category headings confirms just how comprehensive Microcomputer Software Directory is. 3,100 software products are listed, under these titles: Systems Software* Utilities* Accounting* Management Systems* Other Business & Commercial Systems* Professional Services* Industry & Manufacturing* Retail & Distribution* Scientific* Educational* Government* Games/Home/Hobby* Miscellaneous*

Each entry gives the package name, function, supplier, cost and also tells you which machines it will run on.

Matching with your machine

If you already have a machine, you'll want to know about compatibility. So we've included an index by machine make and model. And, just to make life easier still, we also cross refer machine type with operating system.



PRODUCTS 3 ACCOUNTING GENERAL PACKAGES

Sord

Operating system: Sord Operating System

Machine model: Sord M23 - all models, Sord M243 - all models, Sord M343 - all models
Memory: 64
Package: ABC Stock Control Accounting Business Controller (ABC) (page 24)
Supplier: ABC Software Ltd.

Machine model: Sord M23 MKII, MKV, MKVI; Sord M243 - all models, Sord M343 - all models
Memory: 64
Package: ABC Nominal Ledger/ Accounting Business Controller (ABC) (page 23)
Supplier: ABC Software Ltd.

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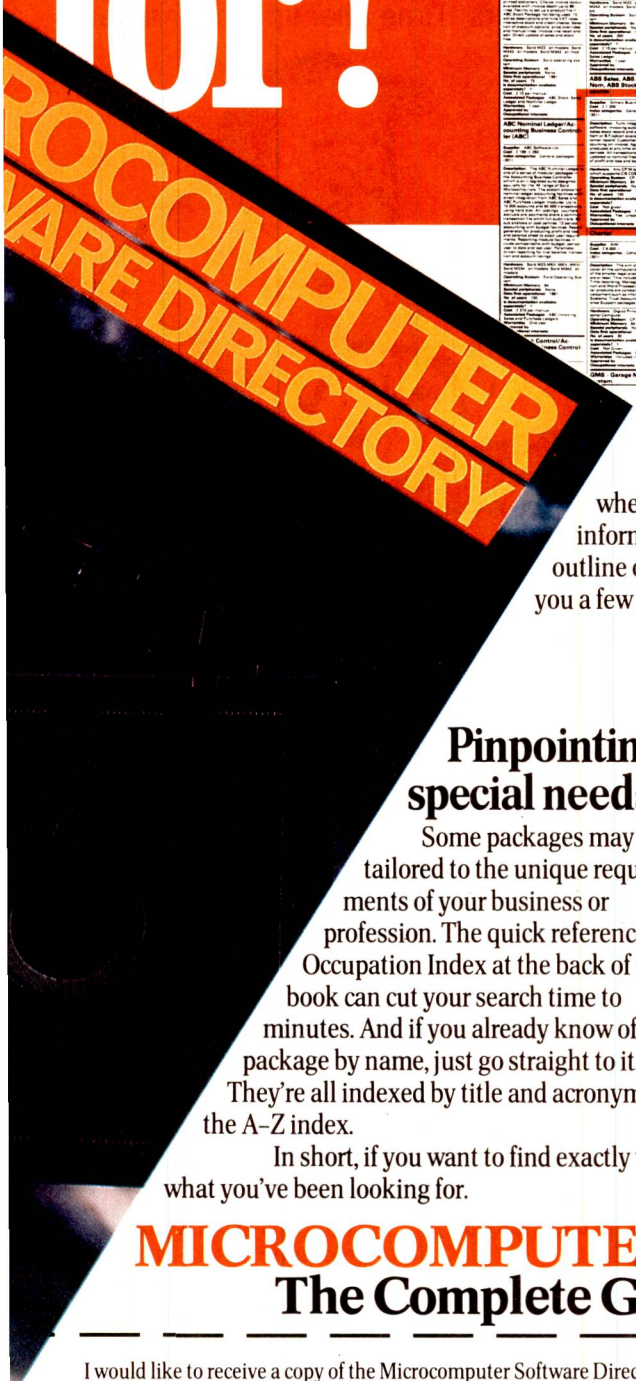

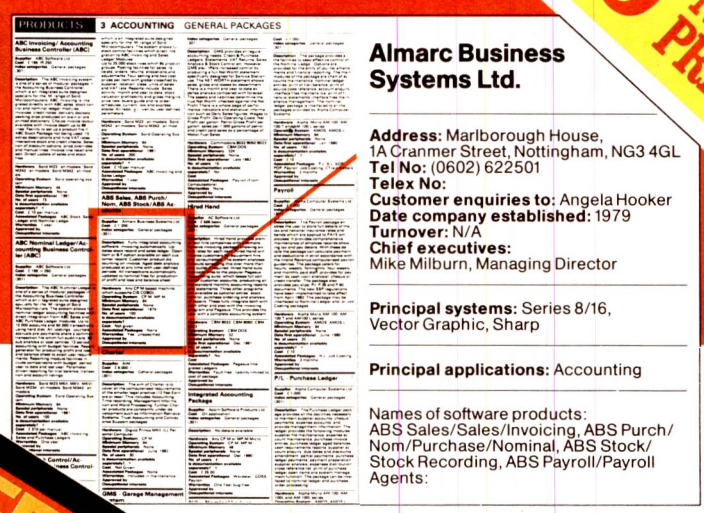
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Almarc Business Systems Ltd.

Address: Marlborough House, 1A Cranmer Street, Nottingham, NG3 4GL
Tel No: (0602) 622501
Telex No:
Customer enquiries to: Angela Hooker
Date company established: 1979
Turnover: N/A
Chief executives: Mike Milburn, Managing Director

Principal systems: Series 8/16, Vector Graphic, Sharp

Principal applications: Accounting

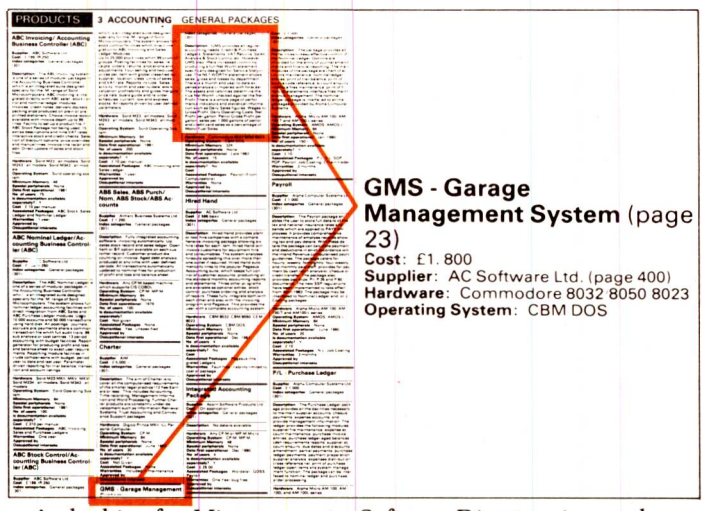
Names of software products: ABS Sales/Sales/Invoicing, ABS Purch/Nom/Purchase/Nominal, ABS Stock/Stock Recording, ABS Payroll/Payroll Agents:

Knowing where to go

There's little point in identifying the perfect package unless you know where to go for it. Our separate alpha listing of suppliers provides all the information you need; addresses, phone numbers, who to speak to, and an outline of which other packages are available from them. This section could save you a few fruitless journeys.

Pinpointing special needs

Some packages may be tailored to the unique requirements of your business or profession. The quick reference Occupation Index at the back of the book can cut your search time to minutes. And if you already know of a package by name, just go straight to it. They're all indexed by title and acronym in the A–Z index.


PRODUCTS 3 ACCOUNTING GENERAL PACKAGES

GMS - Garage Management System (page 23)
Cost: £1,800
Supplier: AC Software Ltd. (page 400)
Hardware: Commodore 8032 8050 8023
Operating System: CBM DOS

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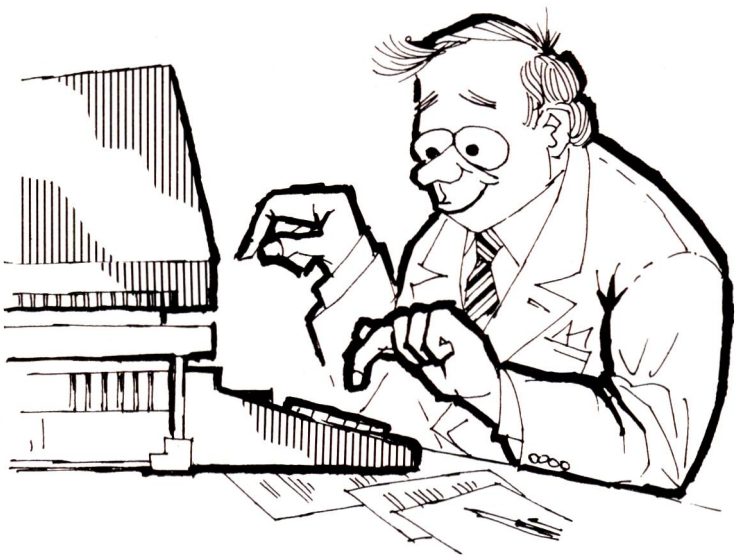

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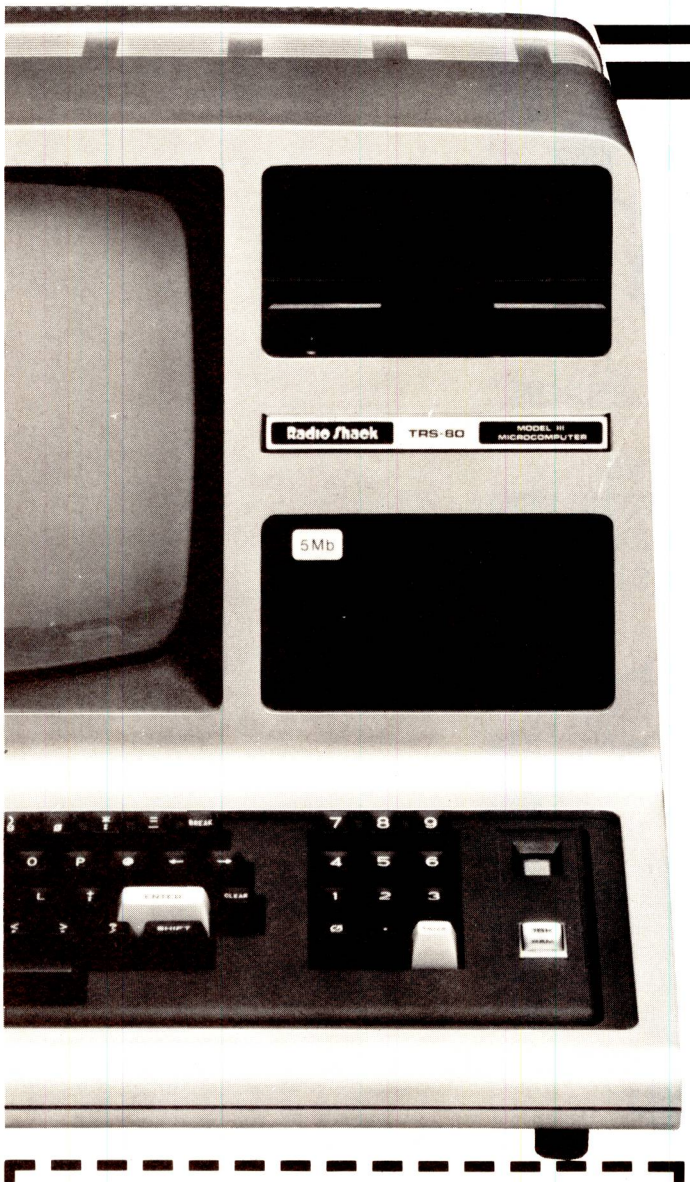

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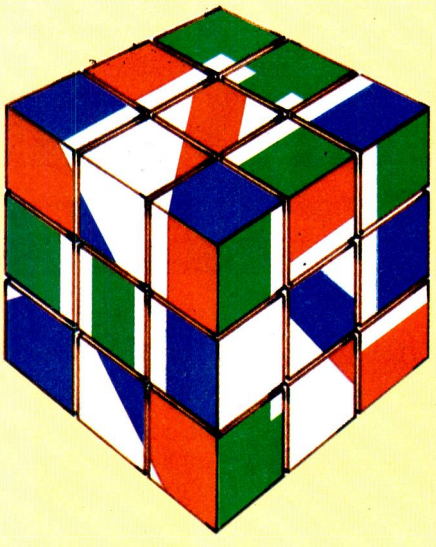

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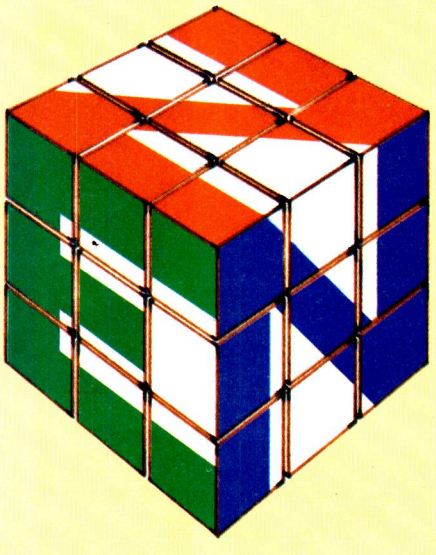

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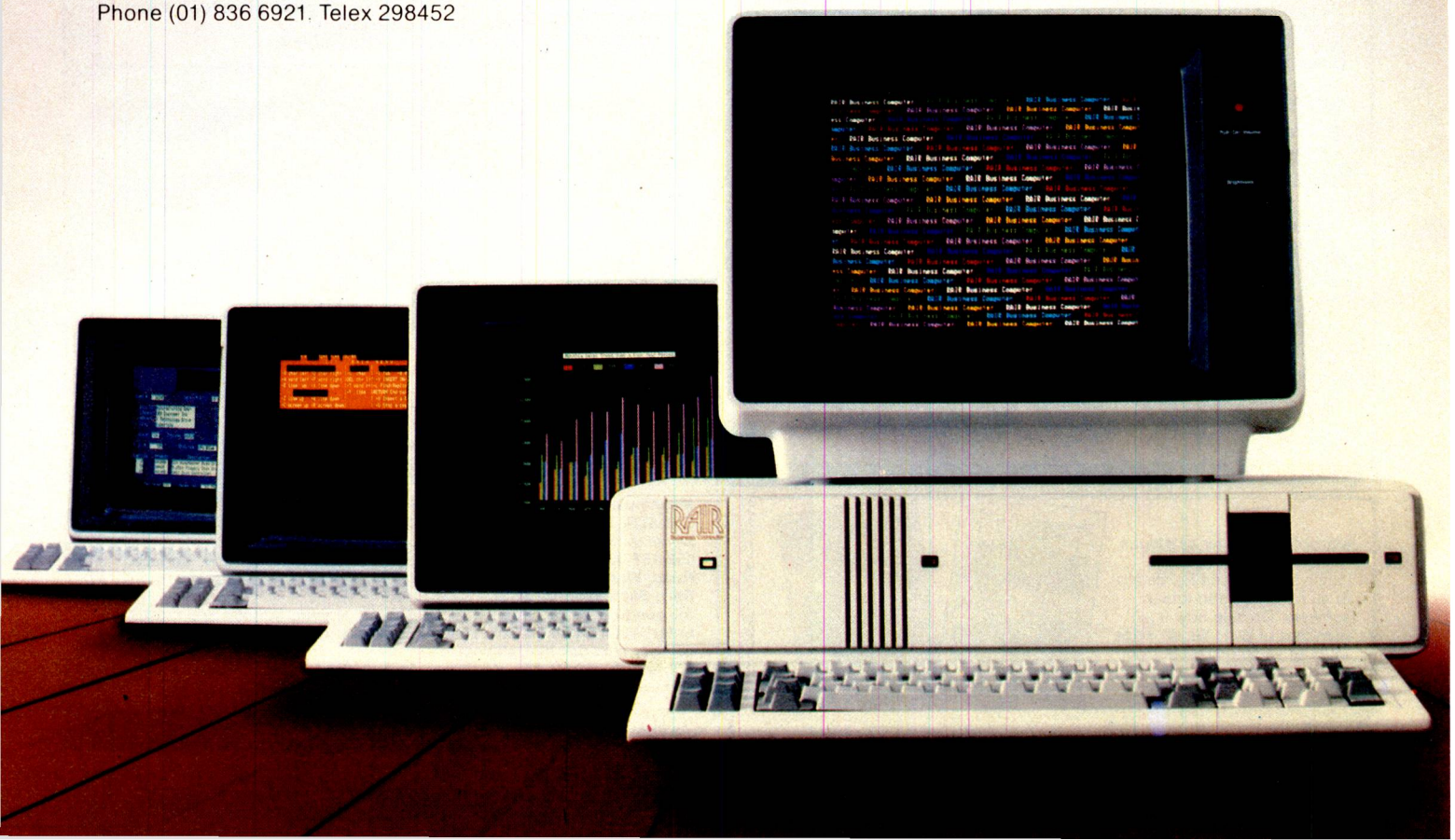



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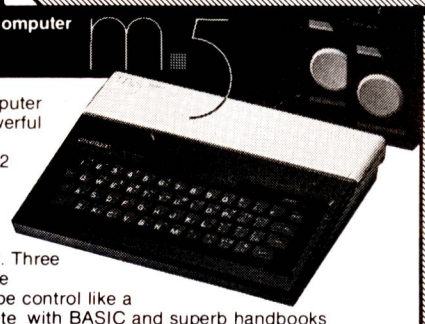

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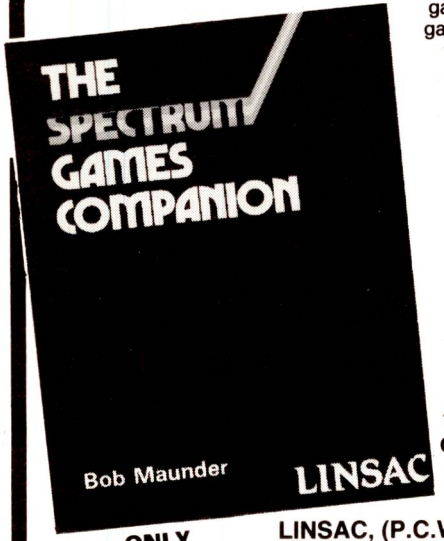

Bob Maunder is co-author of 'The ZX80 Companion' and author of 'The ZX81 Companion'. He is a Senior Lecturer in Computer Science at Teesside Polytechnic, holds an MSc degree in Computer Science, and is a Member of the British Computer Society.

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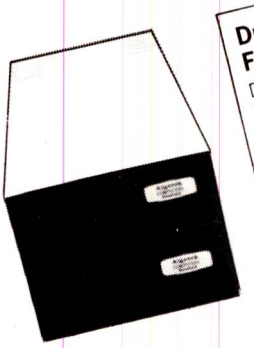

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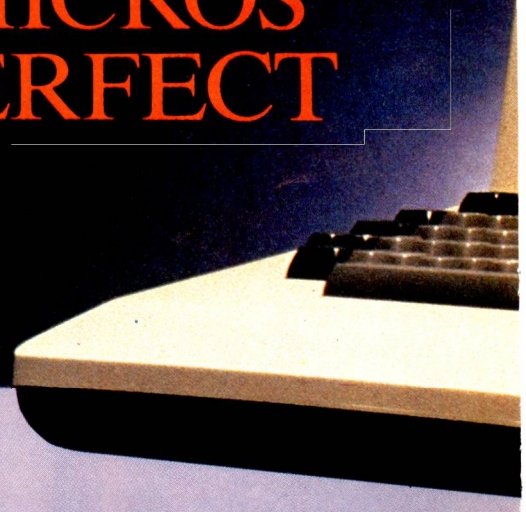

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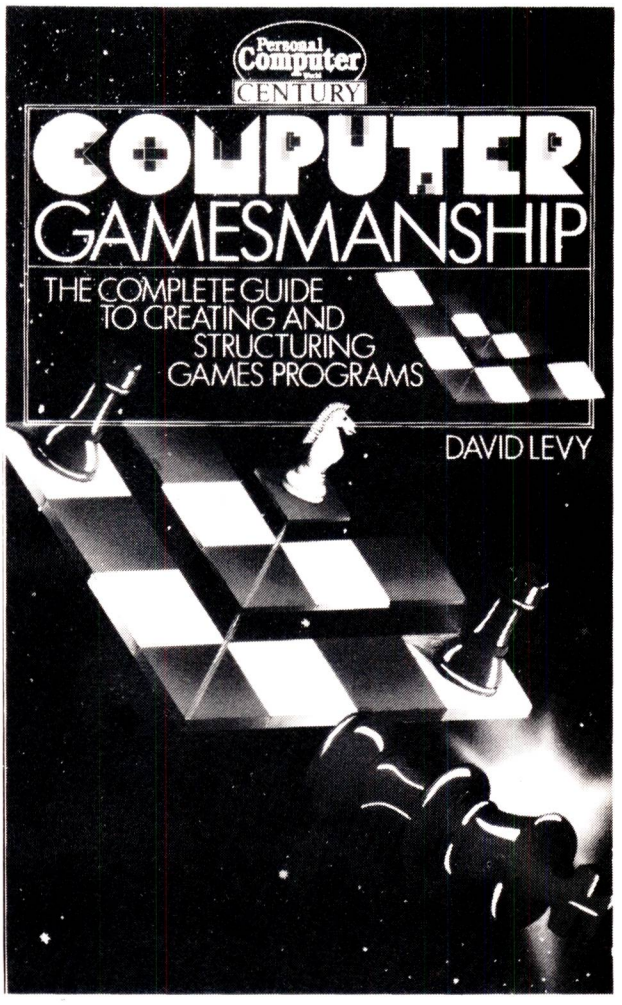

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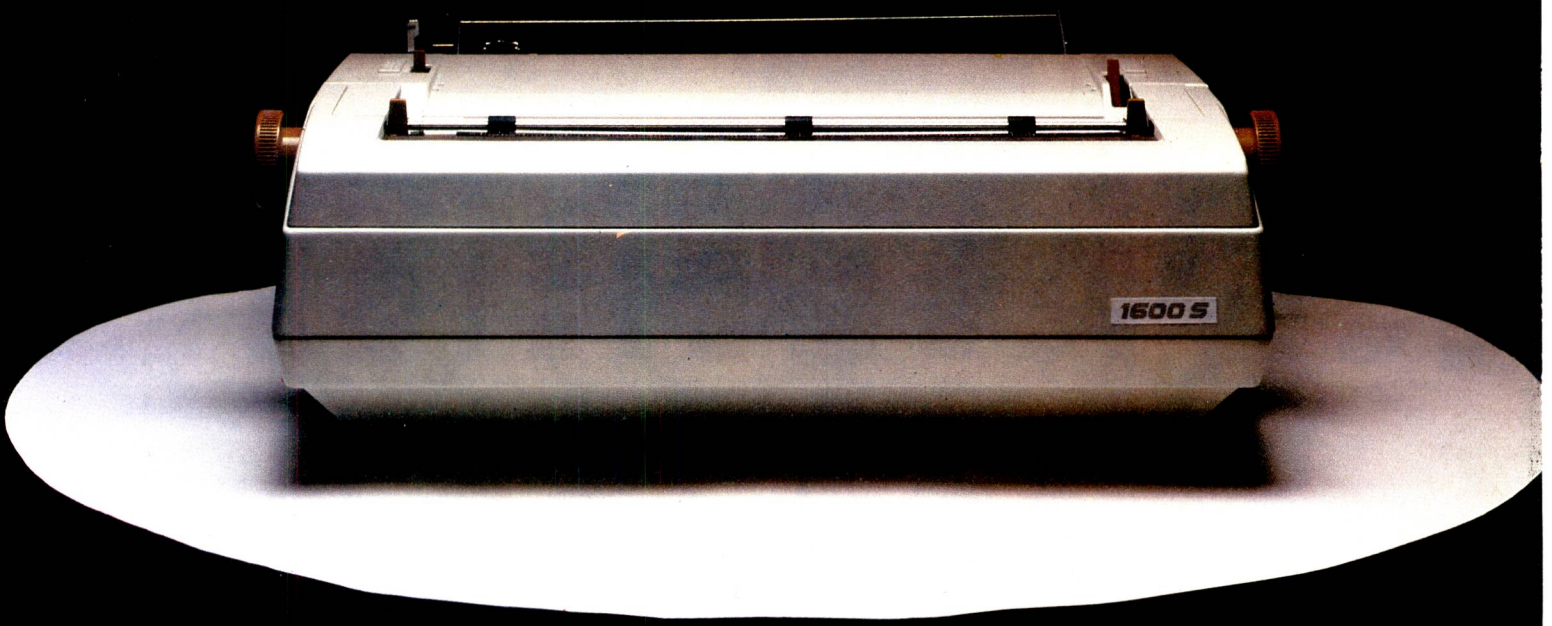

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