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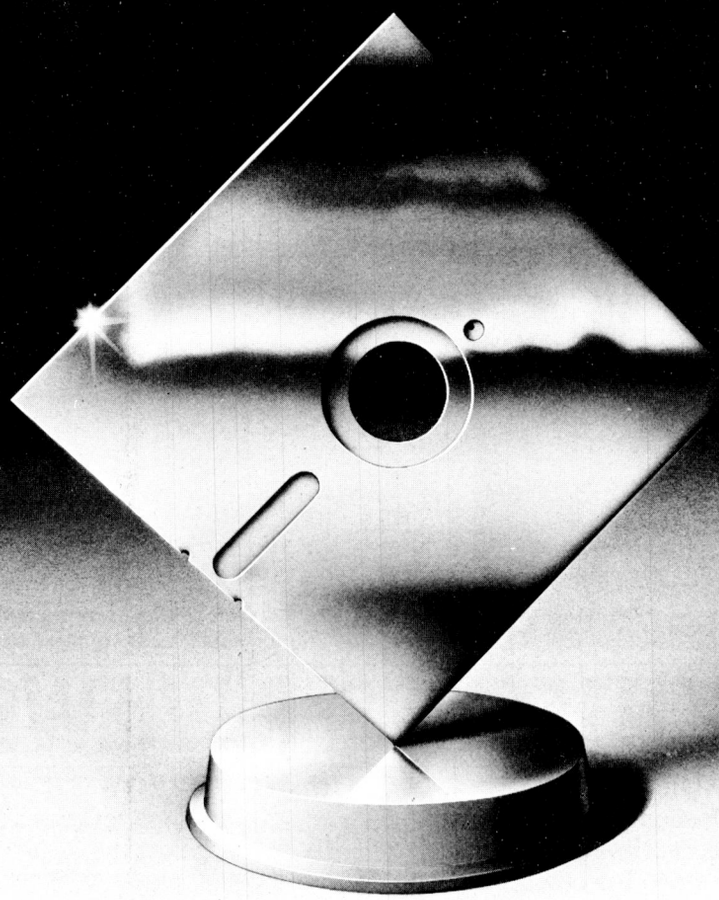

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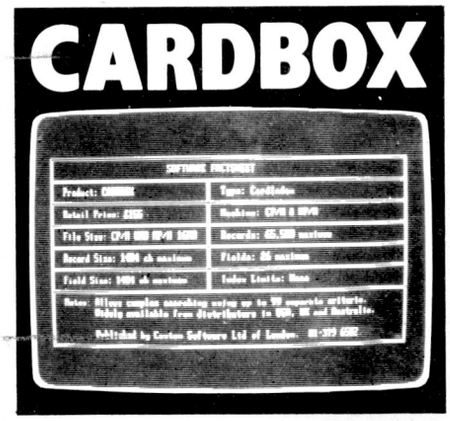

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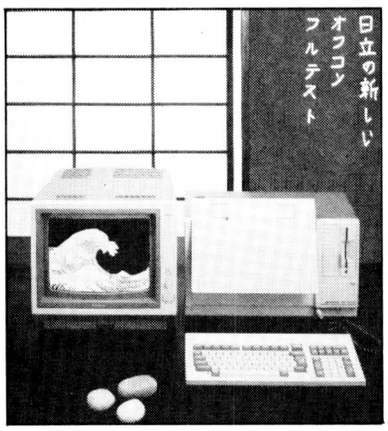

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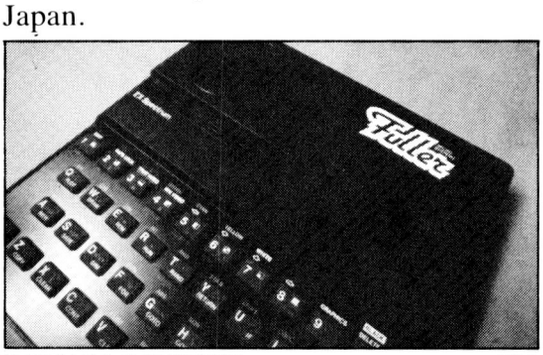

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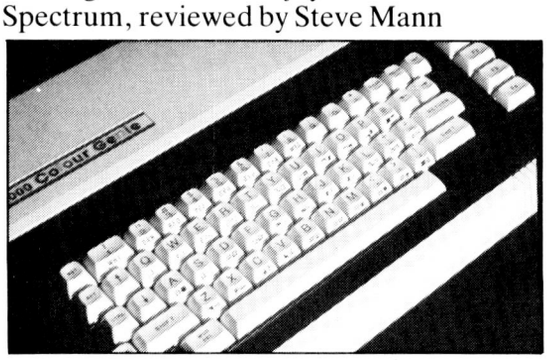

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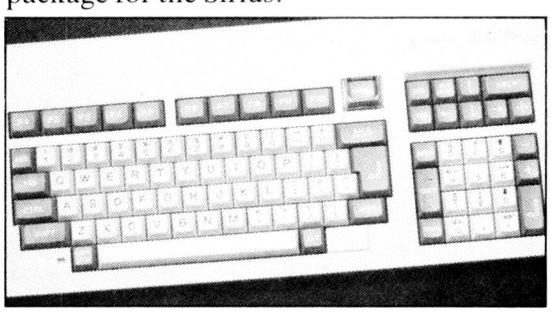

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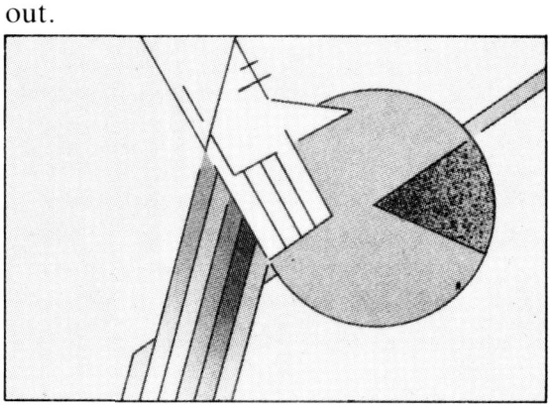

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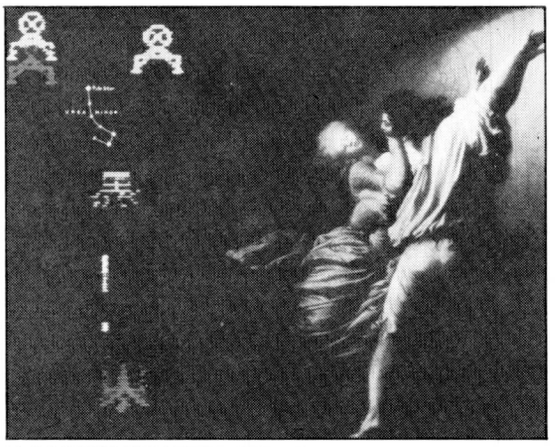

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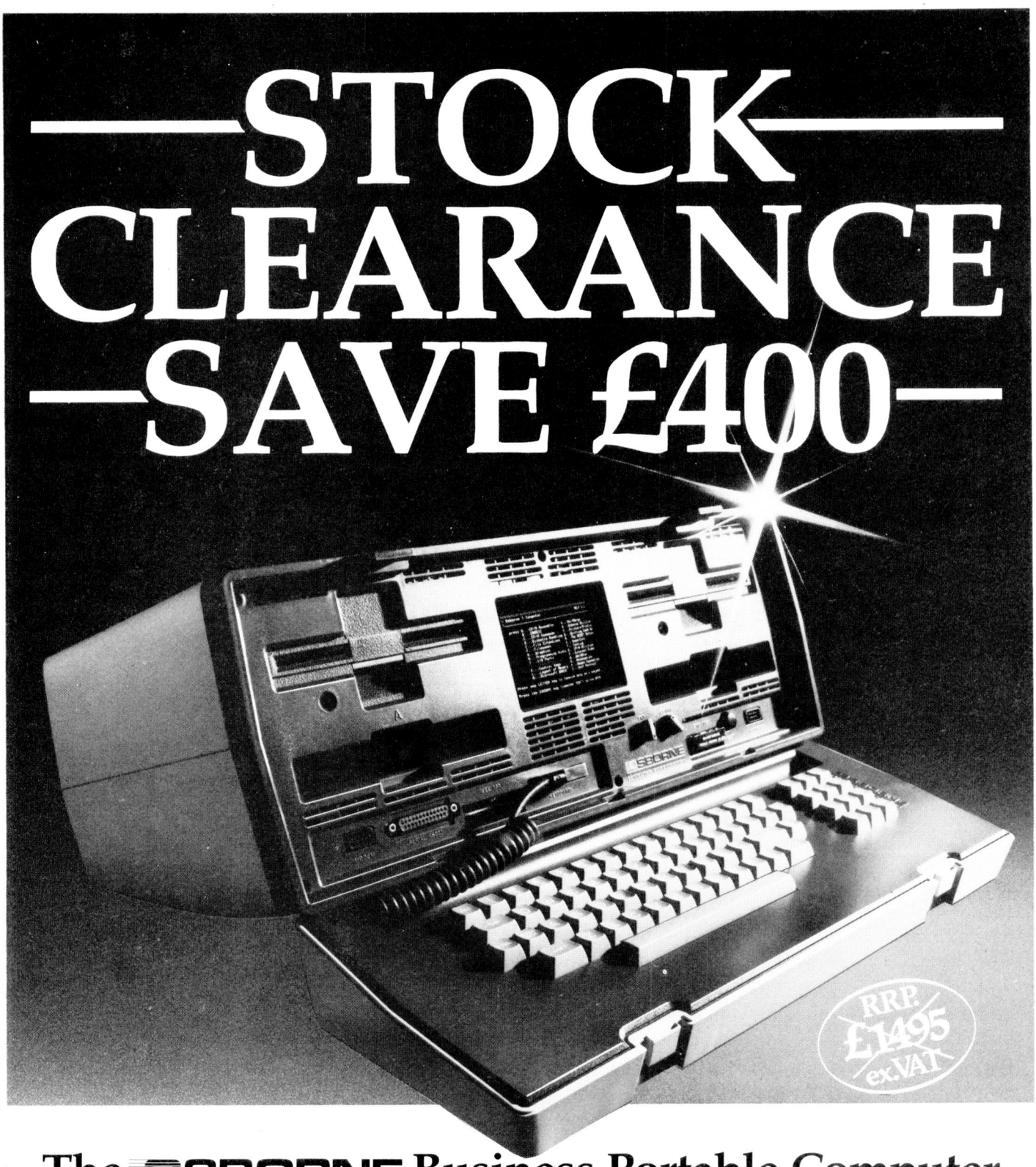

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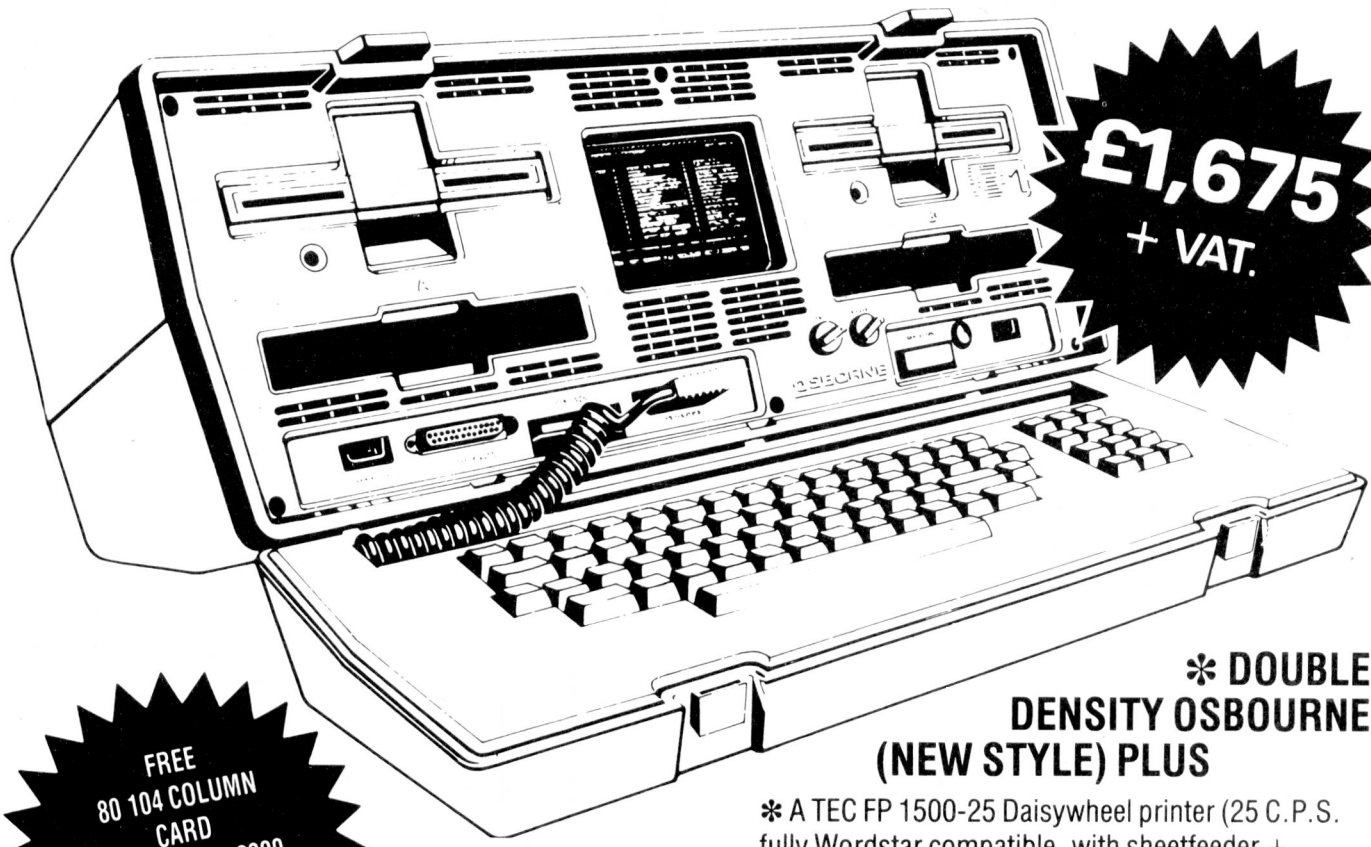

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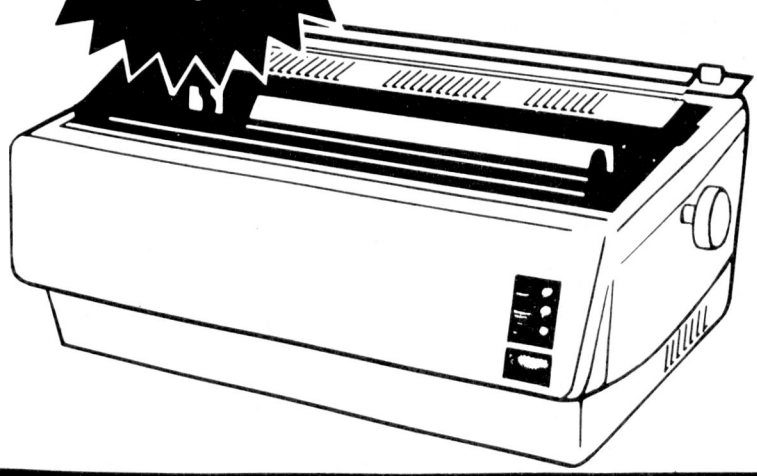

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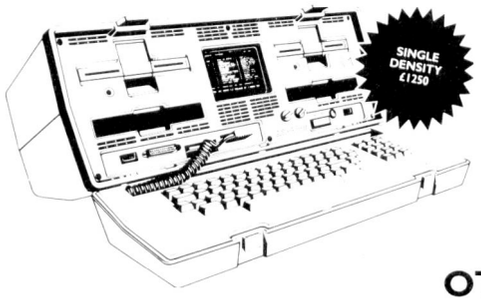

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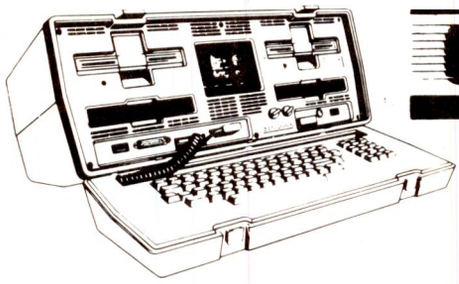

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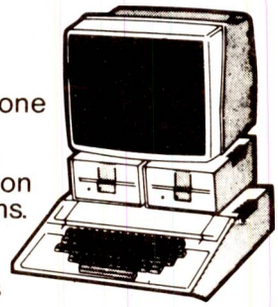

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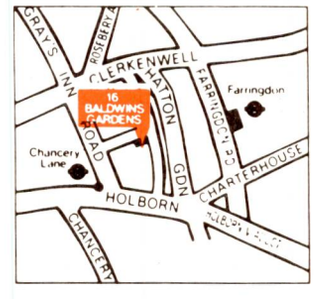

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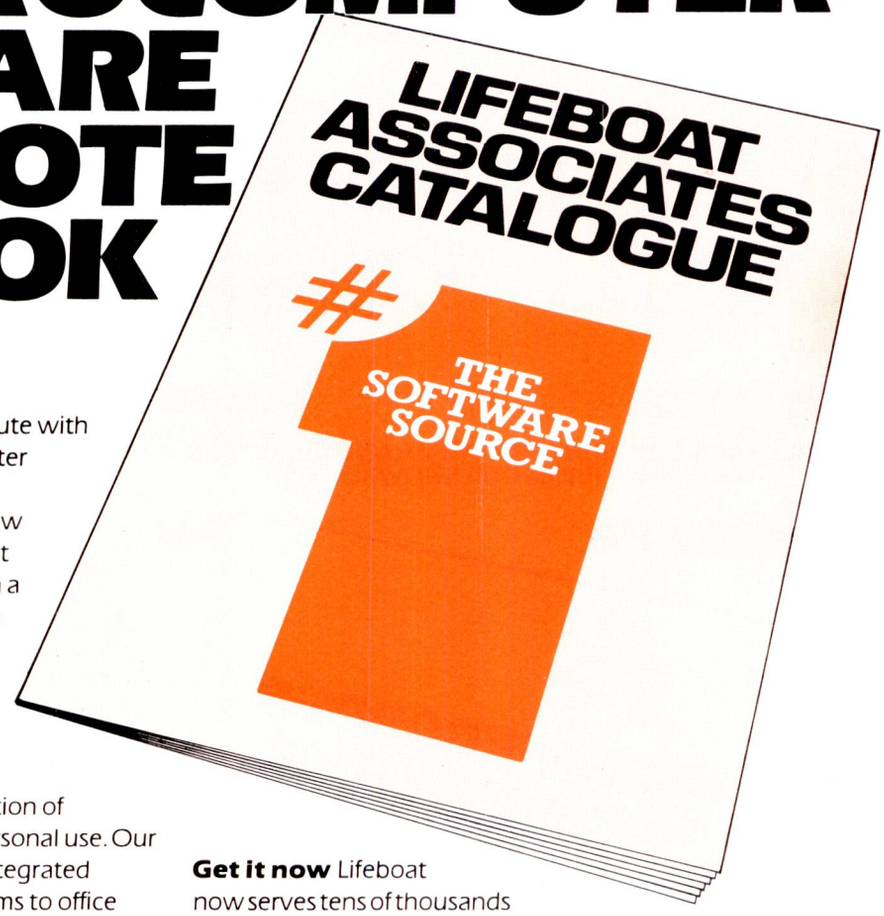

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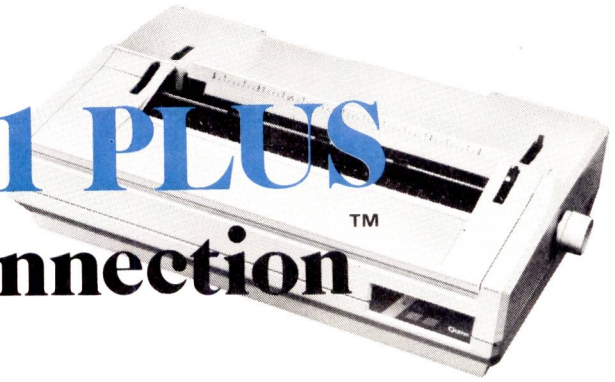



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6845	650
6847	650
6850	110
6852	250
6854	599
68B54	780
6875	500
68000	£70
74C922	400
8080A	250
8085A	350
8088	£18
81LS95/96	80
81LS97/98	80
8118-10	225
8123	125
8155	350
8156	350
8202	£25
8205	225
8212	110
8214	425
8215A-300	300
8216	100
8224	110
8226	250
8228	220
8243	270
8250	850
8251	250
8253	400
8255	255
8256A	£35
8257	400
8259	395
8271	£28
8279	385
8282	450
8283	450
8284	350
8285	365
8287	£12
8288	£10
8T26A	95
8T27	150
8T28A	120
8T31	350
8T95N	90
8T97N	90
9364AP	550
9602	220
AM26LS31/2	125
AY-3-1015	300
AY-3-1270	675
AY-3-8910	375
AY-5-1013	300
AY-5-1350	388
AY-5-2376	600
AY-5-3600	750
COM8017	275
COM8116	700
DM8131	275
DP8304BN	250
DS3691N	320
DS88LS120N	275
DS8820	110
DS8830	110
DS8831	125
E9365/6	£38
FD1761	£15
FD1771	£15
FD1791	£22
FD1793	£23
FD1795	£28
FD1797	£28
IM6402	380
INS8060N	1050
INS8154N	£9
MC1488/9	55
MC14411	875
MC14412	725
MC3446	215
MC3447P	315
MC6846	625
MM5280D	695
MM5303	635
MM5307	1275
MM5387A	475
MM58174	700
RO-3-2513L	650
RO-3-2513U	600
SFF96364E	800
SPO256 Al2	£11
TMS2716-3	725
TMS4164-15	475
TMS4500	£14
TMS5100	600
TMS6011	365
TMS9927	£14
TMS9929	£20
TMS9995	£12
ULN2003	75
UPD7002	425
Z80CPU2.5	299
Z80ACPU	300
Z80B	875
Z80CTC	250
Z80ACTC	260
Z80DART	495
Z80ADART	495
Z80DMA	675
Z80ADMA	895
Z80P10	260
Z80AP10	275
Z80S10	850
Z80AS10	900
ZN419	180
ZN423E	138
ZN424E	130
ZN425E-8	345
ZN426E-8	300
ZN427	130
ZN427E-8	590
ZN428E	410
ZN429E-8	210
ZN459	570
ZN1034E	200
ZN1040	665
ZNA234E	850

74S Series

74S00	30
74S02	30
74S03	32
74S04	30
74S08	40
74S10	40
74S20	40
74S27	40
74S32	70
74S74	75
74S112	80
74S132	110
74S133	60
74S138	100
74S139	115
74S155	39
74S158	195
74S175	260
74S188	140
74S189	140
74S194	195
74S201	250
74S225	240
74S240	390
74S241	250
74S244	290
74S257	170
74S260	50
74S262	850
74S287	225
74S288	210
74S289	200
74S301	000
74S365	000
74S374	365
74S470	325
74S471	620
74S472	1150
74S475	25
74S571	620

75 Series

75159	125
75107/8	95
75150/54	125
75154	125
75182/3	99
75188/9	55
7532	140
75450	86
75451/2	52
75454	70
75491/2	65

TTL74

7400	11
7402	11
7404	13
7410	14
7411	15
7423	18
7414	20
7420	15
7422	20
7427	18
7430	14
7442	32
7447	40
7448	40
7473	24
7474	20
7475	25
7485	60
7486	20
7489	170
7490	20
7491	35
7492	25
7493	25
74100	80
74116	50
74121	25
74125	35
74126	35
74143	210
74148	60
74150	50
74151	40
74153	40
74154	55
74186	470
74188	250
74383	99

74LS

LS00	11
LS02	11
LS04	12
LS08	12
LS10	12
LS11	12
LS13	15
LS14	26
LS19	58
LS20	13
LS22	12
LS27	12
LS32	13
LS30	12
LS42	28
LS47	35
LS48	55
LS63	120
LS73	18
LS74	18
LS75	20
LS85	42
LS86	16
LS90	24
LS91	60
LS92	32
LS93	23
LS125	24
LS126	25
LS138	25
LS139	28
LS148	70
LS151	40
LS153	40
LS156	36
LS157	25
LS158	30
LS175	36
LS240	55
LS241	55
LS242	55
LS243	55
LS244	50
LS245	70
LS273	54
LS373	60
LS374	55
LS393	42
LS471	629
LS640	180
LS641	180
LS645	180
LS668	125
LS669	120
LS670	100
LS673	550

CMOS

4000	40
4001	10
4002	12
4009	24
4010	24
4011	10
4012	16
4016	20
4017	32
4018	45
4023	13
4025	13
4027	20
4034	140
4040	40
4051	45
4052	60
4053	50
4066	24
4068	14
4069	13
4070	13
4076	50
4077	13
4078	15
4081	13
4093	20
4099	75
4160	95
4161	99
4162	99
4163	99
4174	99
4175	105
4411	690
4412	790
4419	350
4450	350
4451	350
4490	350
4500	675
4504	75
4505	185
4508	130
4511	46
4519	30
4528	50
4549	375
4569	175
4583	90
4584	40
4585	60
4597	330
4598	290
4599	290
40101	130
40105	105
40106	25
40108	198
40110	198
40114	240
40163	50
40244	195
40245	195
40373	160
40374	245
45106	595

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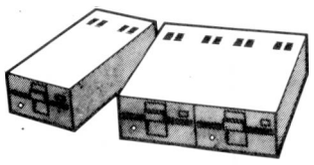

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Bi-directional, 80 column, 100CPS, Logic seeking, Hi-Res, block graphic Forward and Reverse line feed, proportional spacing, true descenders, 2K buffer, at a giveaway price:

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32 768KH	100	16 0MHz	200
1MHz	275	18 0MHz	180
1 6MHz	392	18 432M	150
1 8MHz	395	19 968M	150
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		
5 0MHz	160		
6 0MHz	140		
6 144MHz	150		
6 5536M	200		
7 0MHz	150		
7 168MHz	160		
7 68MHz	200		
8 0MHz	150		
9 0MHz	200		
9 375M	350		
10 0MHz	175		
10 7MHz	150		
10 24MHz	200		
12 0MHz	175		
12 528M	300		
14 31818	170		

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Watford's specially designed 4K Ultimate Monitor IC for UK101 & Superboard

Only £10.

IDC Connectors:

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
34 way	205p	236p	160p	320p
40 way	220p	250p	190p	340p
50 way	235p	270p	200p	395p

JUMPER LEADS Ribbon Cable Assembly/DIL Plug (Headers)

Single Ended Lead 24" Long

Length	14pin	16pin	24pin	40pin
24"	145p	165p	240p	325p
Double Ended Leads				
6"	185p	205p	300p	465p
12"	198p	215p	315p	490p
24"	210p	235p	345p	540p
36"	230p	250p	375p	595p

IDC FEMALE RECEPTACLE JUMPER LEADS

36"	20way	26way	34way	4way
1end	160p	200p	260p	300p
2end	290	370p	480p	525p

DIL SOCKETS

	Low Prof	Wire Wrap
8pin	8p	25p
14pin	10p	35p
16pin	10p	42p
18pin	16p	52p
20pin	22p	60p
22pin	25p	70p
24pin	25p	70p
28pin	28p	80p
40pin	30p	99p

RIBBON CABLE

Ways	Grey Price per Foot	Colour Price per Foot
10	15p	28p
16	25p	40p
20	30p	50p
26	40p	65p
34	60p	85p
40	70p	90p
64	100p	135p

DIL PLUGS (Header)

	Solder	IDC
14pin	38p	95p
16pin	42p	100p
24pin	88p	130p
40pin	195p	218p

AMPHENOL PLUGS

24way IEEEE	560p
26way Centronics	
Parallel	520p

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24way	575p
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EURO (DIN) CONNECTORS

	Female Strt. Pins	Female Angle Pins	Male Strt. Pins	Male Angle Pins
DIN41617				
31 way	170p	–	–	175p
41612 A+B 2×32 way	275p	320p	220p	285p
41612 A+C 2×32 way	295p	340p	240p	300p
41612 A B C 3×32 way	360p	385p	260p	395p

EDGE CONNECTORS

TWO ROWS	.1"	.156"
2×18way	180p	145p
2×22way	199p	200p
2×23way	170p	
2×25way	225p	280p
2×28way	210p	
2×30way	245p	
2×36way	295p	
2×40way	315p	
2×43way	395p	

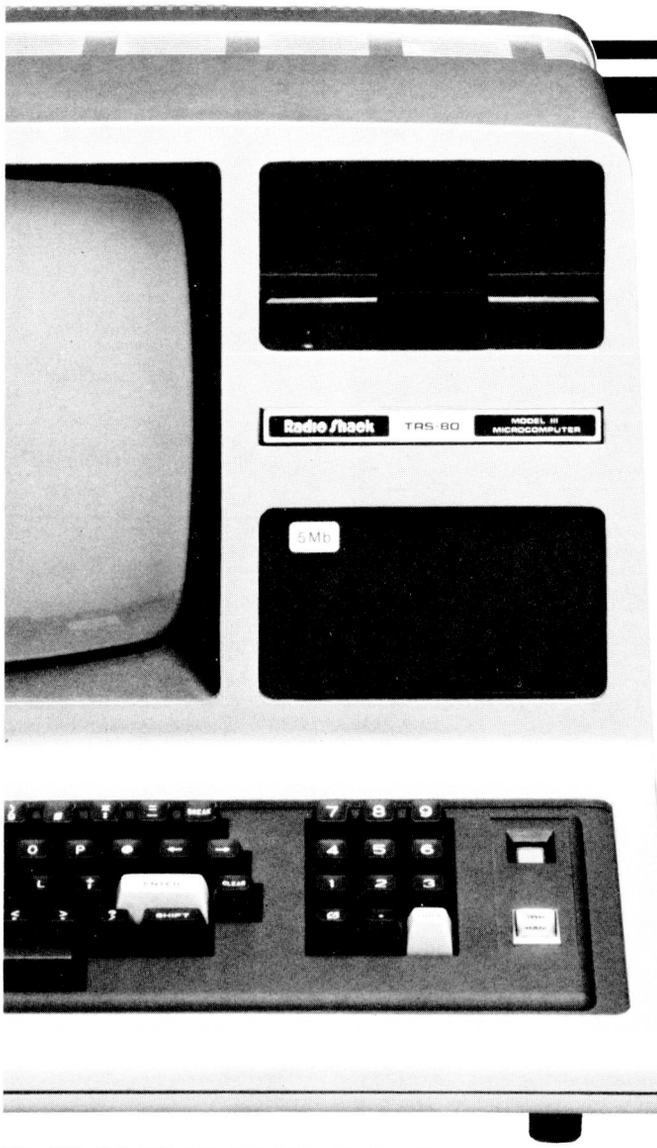
D CONNECTORS: Miniature

Male	9 way	15 way	25 way	37 way
Solder	80p	110p	160p	250p
Angle	160p	210p	250p	355p
Pins	120p	130p	195p	295p
Female				
Solder	110p	160p	210p	350p
Angle	165p	215p	290p	440p
Pins	150p	180p	240p	420p
Covers	100p	95p	100p	110p

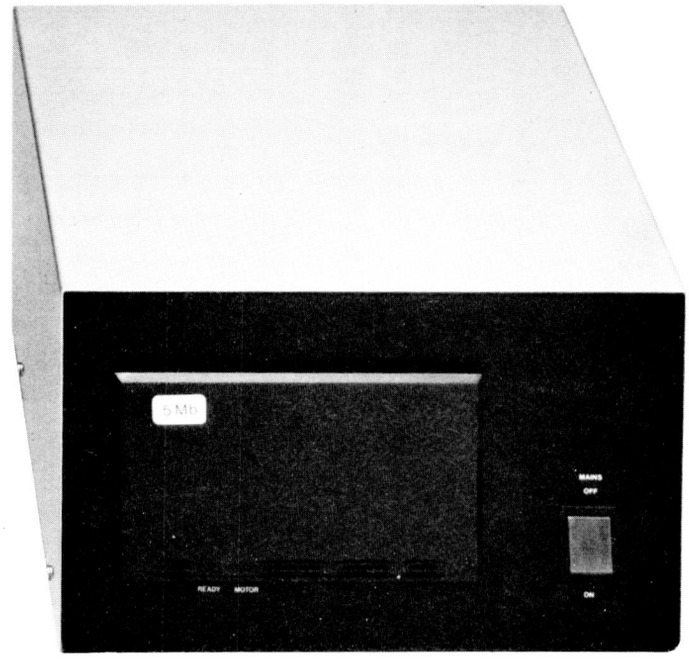
IDC 25way 'D' plug 385p Skt 450p

Cumana-Mod III Winchester the finest drive in the West!

at a very competitive price



With the quality Rodime R0200 Series of **5¼" Winchester Drives Cumana** gives TRS-80 Model III owners high capacity at low cost. Internally mounted hard disks offer storage capacities from 5.25 M.B. to 21 M.B. The internal kit is comprised of mounting frame, hard disk, power supply unit, controller and fan.



The mounting frame also allows for the installation of either one or two slimline floppy disk drives. For Model III owners who already have internal floppy disk drives we can supply an externally boxed unit. Disk operating systems are obtainable from Molimerx (L.DOS) 0424-220391 & Microfirm (DOS Plus) 0454-322260. Business Software is available from Tridata 021-662-6085.

5.25 to 21	M.B. (Formatted)	Internal Kit at	**£1395** **£2195**

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CASH BOOK ACCOUNTS PROGRAM FOR BBC 32K, TORCH, SPECTRUM 48K

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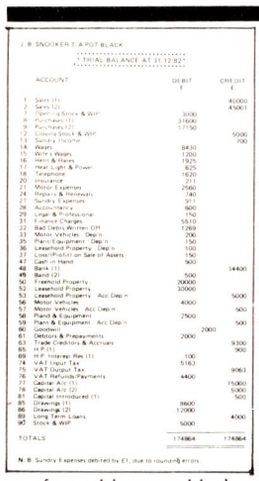

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Requires Cash Book module. This program will take your cash book data to the logical conclusion of balance sheet, trading and profit/loss account and notes to the accounts i.e. fixed assets, land and buildings and capital accounts. Final accounts (BBC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

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

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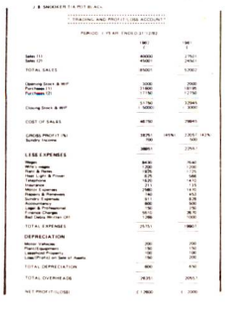

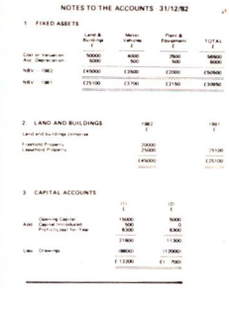

"Gemini's range of software is in the vanguard of the releases for 'serious' micro users..."
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Compatible with most micros. See table. A superb dedicated database to allow for manipulations of names and addresses and other data. Gemini's unique 'searchkey'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



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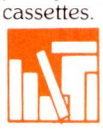

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```
POSITION A1 RC SPACE 5185 T
     II      A      II   B  II   C  II
 1  -J.B. SNOOKER T/A POT-BLACK
 2  PROJECTED CASH FLOW          YEAR      ENDED
 3
 4                               Oct.      Nov.
 5                                £         £
 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:-

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- Enter your source data and have the results calculated.
- Save the results on tape (or disk – BBC) for later reloading and manipulation.
- Print the tabulated results in an elegant report format.
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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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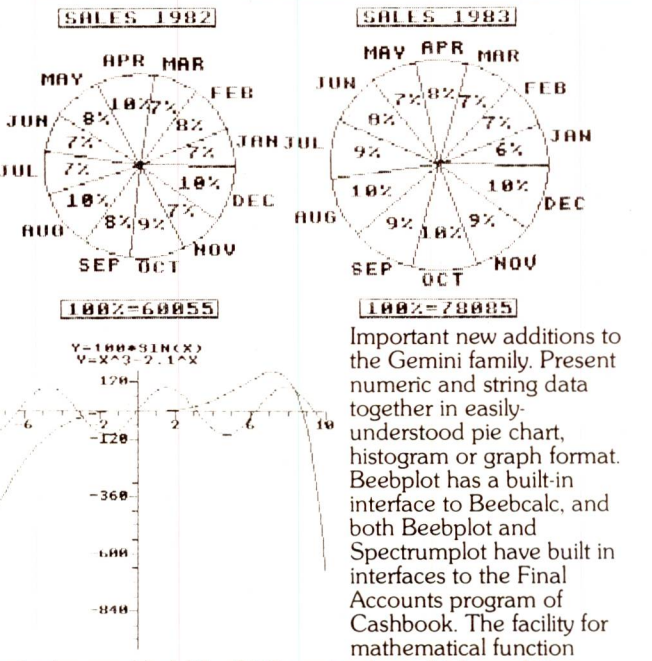
- Comparing rent/lease/buy options.
- Processing the results of scientific experiments or field studies.
- Engineering calculation models.
- In fact, anything that involves repeated re-calculation of results presented in tabular or spreadsheet format.

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 MZ808	●	●	●	●				●	●		
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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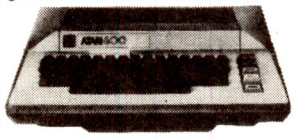

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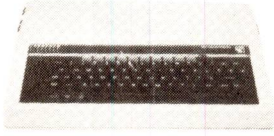

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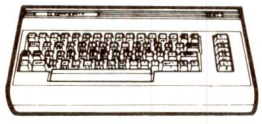
Selection of educational, graphic games software available.



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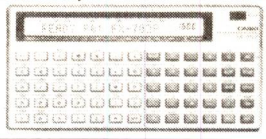

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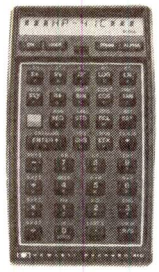

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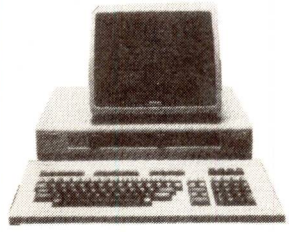

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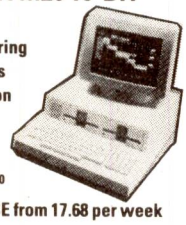

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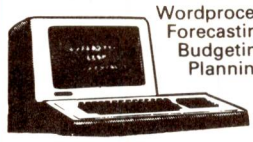

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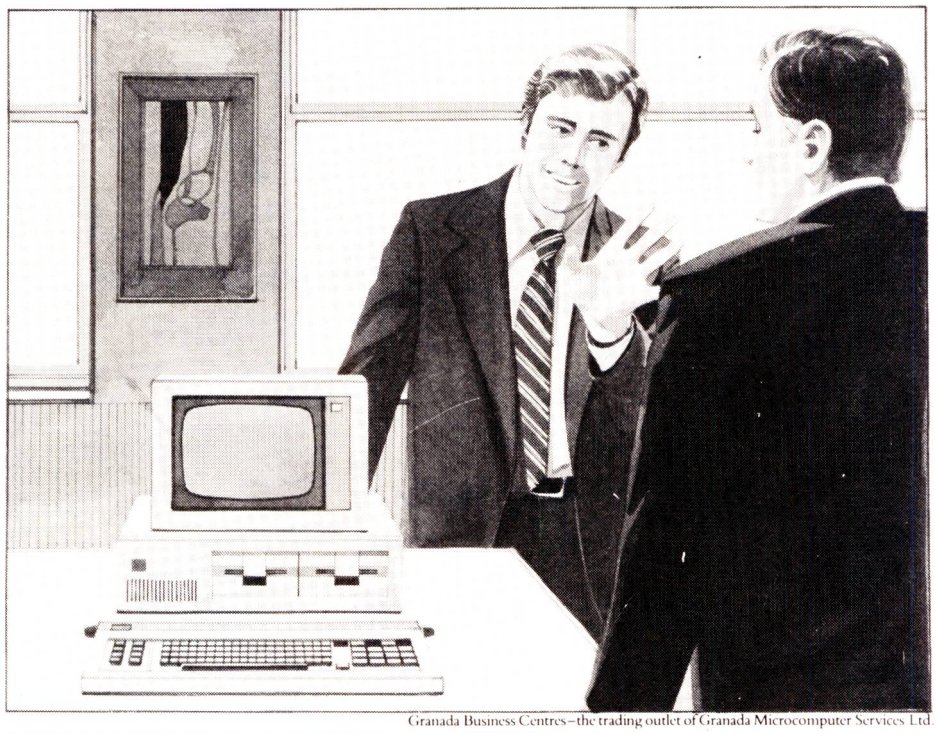

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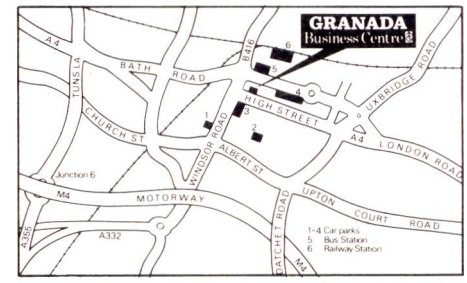

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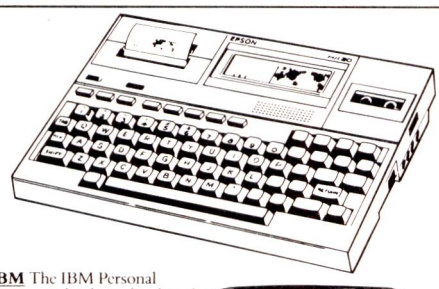

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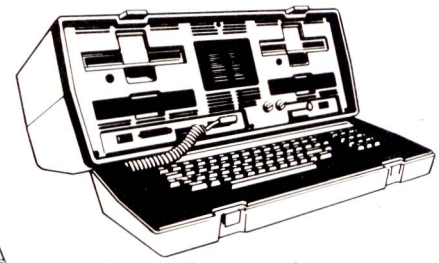

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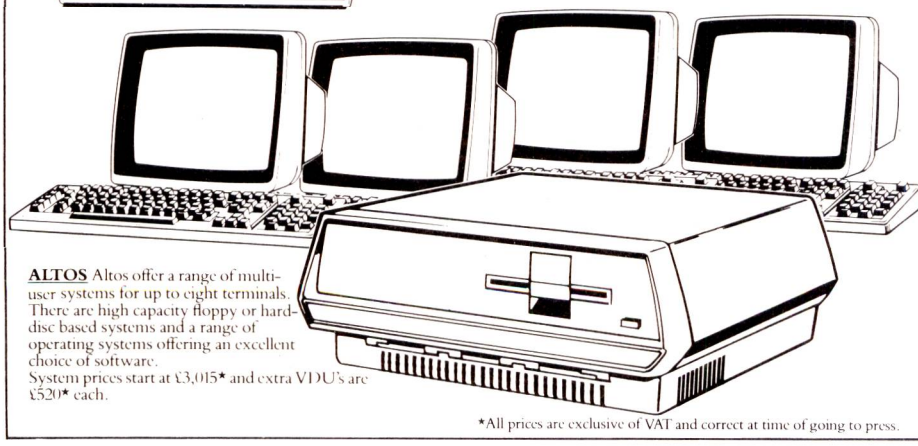

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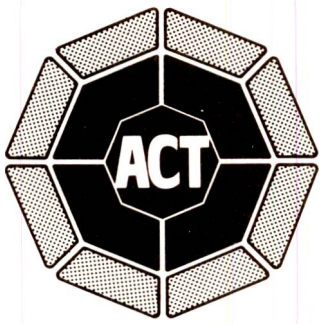

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10 way	90p	85p	120p
20 way	145p	125p	195p
26 way	175p	150p	240p
34 way	200p	160p	320p
40 way	220p	190p	340p
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Single End	145p	165p	240p	380p
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D CONNECTORS

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MALE				
Solder	**80p**	**105p**	**160p**	**250p**
Angled	**150p**	**210p**	**250p**	**365p**
FEMALE				
Solder	**105p**	**160p**	**200p**	**355p**
Angled	**165p**	**215p**	**290p**	**440p**
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2×32 way Ang. Pin	**275p**	**320p**
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(please specify a + b or a + c)

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2×22 way	**190p**	**240p**
2×23 way	**175p**	–
2×25 way	**225p**	**220p**
2×28 way	**190p**	–
1×43 way	**260p**	–
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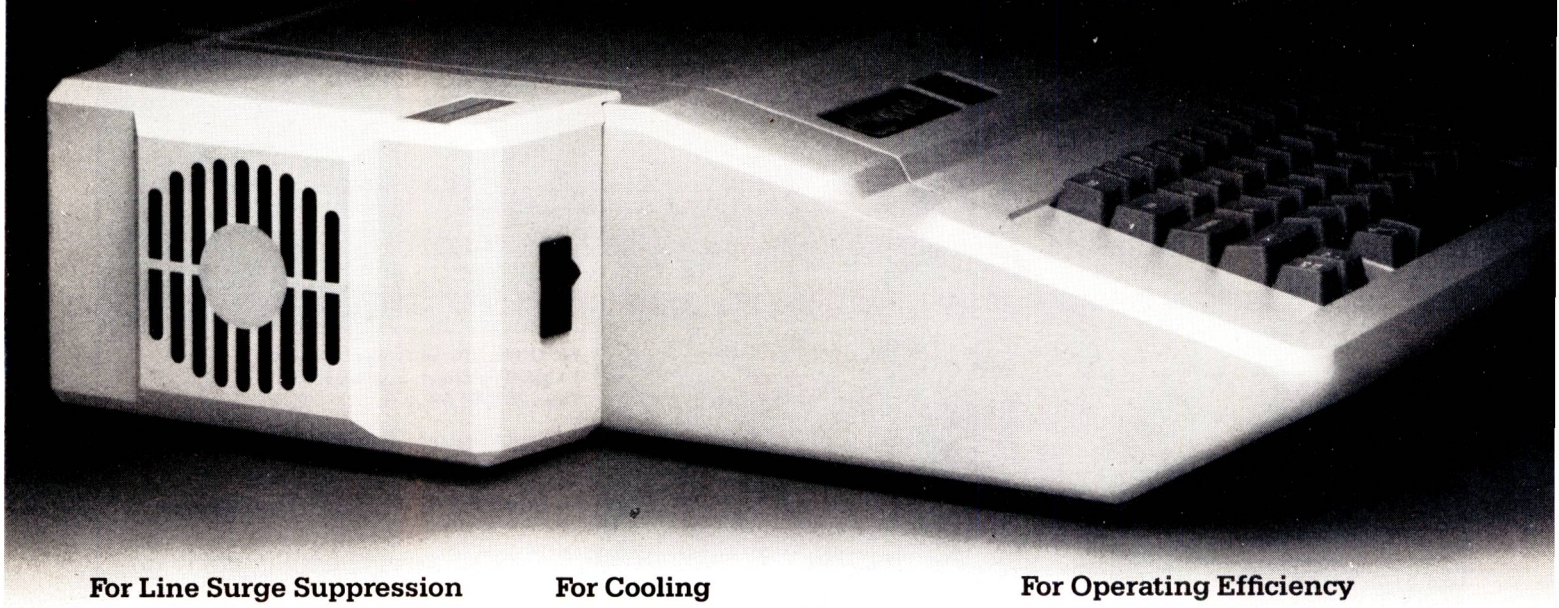

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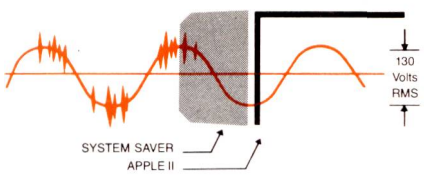
The SYSTEM SAVER provides essential protection to hardware and data from dangerous power surges and spikes.



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

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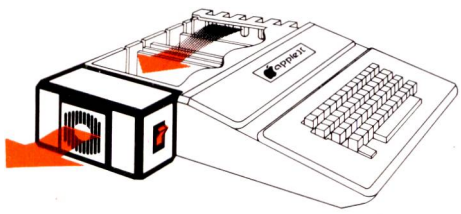
As soon as you add 80 columns or more memory to your Apple II you need SYSTEM SAVER.

Today's advanced peripheral cards generate more heat. In addition, the cards block any natural air flow through the Apple II creating high temperature conditions that substantially reduce the life of the cards and the computer itself.



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

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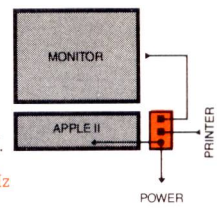
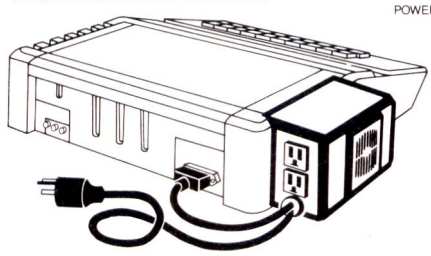
SYSTEM SAVER contains two switched power outlets. As shown in the diagram, the SYSTEM SAVER efficiently organizes your system so that one convenient, front mounted power switch controls SYSTEM SAVER, Apple II, monitor and printer.



Available in 220/240 Volt. 50 Hz



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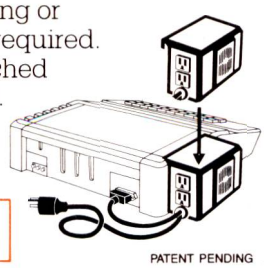
Just clips on.
No mounting or hardware required.
Color matched to Apple II.



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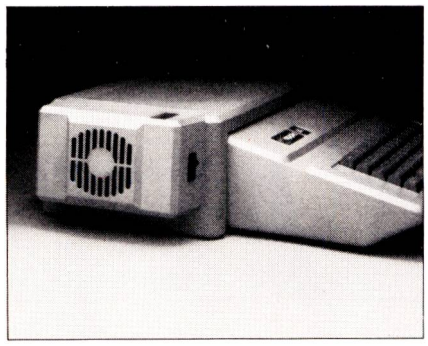

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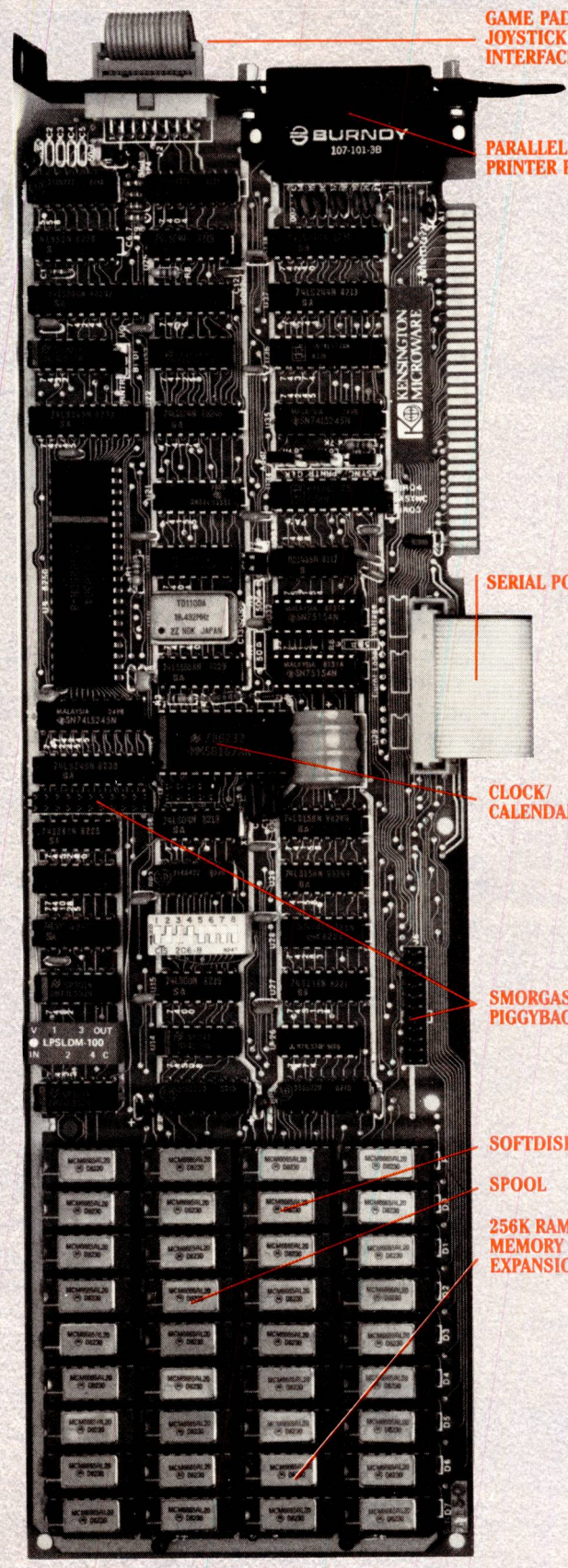

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High Resolution	240x200
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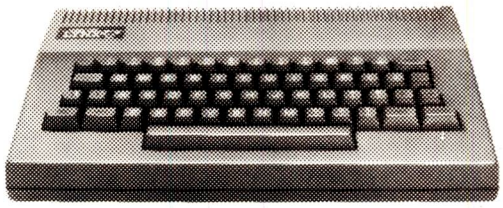
The powerful and infinitely expandable LYNX



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

Spectrum Price

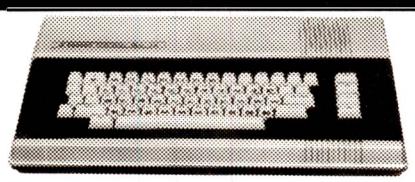
£225.00 Inc. VAT

VISCOUNT - Teach yourself LYNX BASIC **£6.95**

SPECTRUM FACTS

Maximum user RAM	13,700 Bytes (approx)
Text Screen	24x30
High Resolution	265x248
Cassette Lead	Included

COLOUR GENIE



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

Spectrum Price £224.48 Inc. VAT

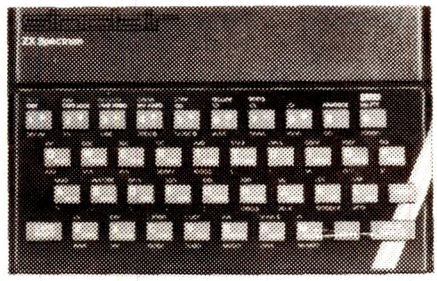
COLOUR GENIE ACCESSORIES

Joysticks	£49.49
16K RAM	£38.50
Printer Interface	£39.95
VISCOUNT Teach yourself Colour Genie Basic	£6.95

SPECTRUM FACTS

Maximum user RAM	**14,200 Bytes (approx)**
Text screen	**24x40**
High Resolution	**160x90**
Cassette Lead	**Included**

SINCLAIR ZX SPECTRUM

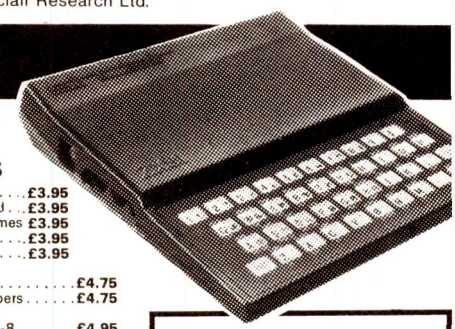


Yes, this top selling micro is now available from Spectrum in both **16K** and **48K RAM**. So now there's no need to send by Mail Order - just call into your local SPECTRUM dealer and pick one up. But just one word of warning: with this added avilability advantage, stocks are bound to sell fast - so make it soon!

SINCLAIR ZX SPECTRUM 16K - £99.95
SINCLAIR ZX SPECTRUM 48K - £129.95

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

SINCLAIR ZX-81

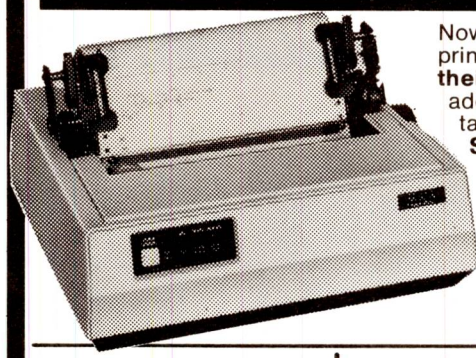


SINCLAIR ZX . . . £49.95
16K RAM pack . . £29.95
ZX Printer £39.95

Computer Bookshop Software for Sinclair Computers	**INC. VAT**
Bumper 7 1K ZX81	£5.95
1K Super Trio ZX81	£7.95
Labyrinth 16K ZX81	£5.95
Nightmare Park/Music 16K ZX81	£6.95
Computacalc 16K ZX81	£7.95
Personal Banking System 16K ZX81	£11.44
Space Invaders/Rescue 16K ZX81	£6.95
Breakout 16K ZX81	£5.95
Mugsy 16K ZX81	£5.95
Mergatroyds 16K ZX81	£5.95
Progmerge 16K ZX81	£5.95
Football Manager 16K ZX81	£7.95
Cassettes for ZX81 Type—10	
6 Games	£3.95
Junior Education	£3.95
Business & Household	£3.95
Skill & Judgement Games	£3.95
Junior Education	£3.95
Family Quiz	£3.95
Type—20	
Fantasy Games	£4.75
Space Raiders & Bombers	£4.75
Type—30	
Super Programs Nos. 1-8	£4.95
Type—40	
Backgammon	£5.95
Flight Simulation	£5.95
Type—50	
English Literature 1	£6.95
English Literature 2	£6.95
Geography	£6.95
History 1	£6.95
Maths. 1	£6.95

ZX-PANDA
16K RAM PACK
ONLY £24.95

OKI MICROLINE Printers

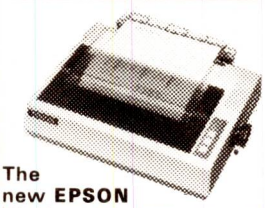


Now from **SPECTRUM** - this **top selling** range of printers **renowned throughout the world for their quality and reliability.** If you're thinking of adding a printer to your micro then you must take a look at the **MICROLINE** range at **SPECTRUM -NOW!** they're **fantastic value-for-money**

Models available

MICROLINE Model 80 £259.90
MICROLINE Model 82A £455.40
MICROLINE Model 92P £585.35

EPSON



The new EPSON RX-80 and **FX** printers now available—check with your local **SPECTRUM** dealer **NOW!**

FX-80 Spectrum Price **£503.70**
RX-80 Spectrum Price **£332.35**

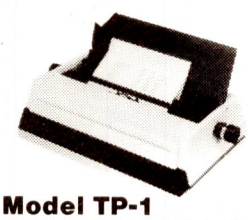
SEIKOSHA



GP-100A

Now a top quality graphic printer at a price you can afford. Centronics interface connects easily with most micros.
Spectrum price **£229.94** Inc VAT Cables & Interfaces available for most micros

SMITH CORONA



Model TP-1

Microprocessor controlled, high quality daisy wheel printer at a LOW cost from SPECTRUM. Serial, Parallel or IEEE Interface.
Spectrum LOW price **£557.75** Inc. VAT

BOOKS

SELECTION FROM THE COMPUTER BOOKSHOP

30 Hour Basic for the BBC Micro	£5.95
Let your BBC Micro Teach You to programme	£6.45
BBC Micro Revealed	£7.95
Over the Spectrum	£6.95
60 Games and Applications for the ZX Spectrum	£4.95
Programming the 6502	£9.95
Programming your ZX Spectrum	£6.95
ZAP Pow Boom for the Vic 20	£7.95
The ZX Spectrum Explored	£5.95
Vic Inovative Computing	£6.95
Mastering Machine Code on your Zx81	£7.50



The ZX Spectrum and how to get the most from it	£5.95
Easy Programming for the ZX Spectrum	£5.95
30 Programmes for the BBC Micro	£4.95
CPM Handbook	£11.50
Programming the Z80	£11.95
20 Best Programmes for the ZX Spectrum	£5.95
Getting aquainted with your Vic 20	£6.95
Machine code and Better Basic	£7.50
The Cambridge Colour Collection (Spectrum)	£6.95
Vic Revealed	£10.00
De RE Atari	£17.00
ATARI Operating system listing	£10.43

MORE SPECTRUM LOW PRICES!

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

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A truly amazing offer on this expandable & Comprehensive top-of-the-line Micro.

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

Plus!

FREE!

Goods worth £50.85

FREE! Pair of Joysticks worth £24.95

FREE! Beginners BASIC Tutor program worth £9.95

FREE! Connect Four program worth £15.95

With every TEXAS TI-99/4A purchased. See opposite for details.



Super NEW LOW PRICES on TEXAS SOFTWARE from Spectrum too!



The Spectrum top 30

Connect Four	£15.95	Oldies but Goodies	£12.95	Adventure & Pirate	£29.95
Zero Zap	£15.95	Soccer	£24.95	Adventure Land	£19.95
Attack	£15.95	Tomb Stone City	£24.95	Mission Impossible	£19.95
Blasto	£15.95	Munchman	£29.95	Voodoo Castle	£19.95
Hustile	£15.95	Chess	£39.95	The Count	£19.95
Yahtzee	£15.95	Parsec	£29.95	Strange Odyssey	£19.95
Hangman	£15.95	Alpiner	£29.95	Mystery Funhole	£19.95
T.I. Invaders	£19.95	**EDUCATIONAL GAMES**		Pyramid of Doom	£19.95
A-maz-ing	£19.95	Dragon Mix	£27.95	Ghost Town	£19.95
Wumpus	£19.95	Aligator	£27.95	Golden Voyage	£19.95
Carwars	£19.95	**ADVENTURE PROGRAMS**			

PLUS!

FREE!

SPEECH SYNTHESISER
or
TI CASSETTE RECORDER
each worth £49.95

When you buy any 6 Texas Software modules.

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

TEXAS TI-99/4A - just part of a complete system.

The **TEXAS T1-99/4A** is just part of a **complete system** which can be **expanded simply & easily** with **optional peripherals (disk drives, printers etc.)** and **easy-to-use Solid State Software modules.** A system which **will meet your needs today & tomorrow** - a system you can **grow with** as and when the needs arise. It can use up to **4 different programming languages** and more than **600 software programs** are available worldwide. Last but not least-it comes from the people with the **greatest experience in microprocessors-the inventors themselves:** so if you're considering buying a home micro you **must** take a look at the **TEXAS TI-99/4A** at your local **SPECTRUM dealer NOW - it really is a terrific buy!**

Unbelievable but true!

TEXAS

TI-99/4A Micro Offer!



Specifications for TEXAS TI-99/4A.

Console CPU: 9900 Family, 16-bit microprocessor, plus 256-byte scratchpad RAM.
Memory: Total combined memory capacity: 110 KBytes. Internal ROM memory supplied: 26 KBytes. External ROM memory: (Solid State Software® command modules) up to 36 KBytes each.
RAM memory supplied: 16 KBytes (Expandable to 48 KB).
Keyboard: 48 key QWERTY with control and function keys (user definable), full upper and lower case capability, alpha lock, auto repeat.
Sound: 5 octaves, 3 simultaneous tones plus noise generator. Each tone controlable in 1Hz steps from 110 Hz to beyond the audible range.
Colours: 16 foreground and background colours.
Video resolution: 192 x 256 (24 x 32 characters).
Power: 240V - 50Hz - 25W in seperate power supply unit.
I/O: UHF modulated PAL colour signal for UK TV receivers.
I/O: UHF modulated PAL-Colour signal for connection to your own T.V. Interface for up to 2 domestic audio cassette recorders. 44-pin peripheral connector-up to 3 peripherals attached simultaneously. System memory and address signals available at peripheral connector. Interface for 2 Wired Remote Controllers.
Built in Software: 14 KByte BASIC interpreter. Internal Graphics Language interpreter, not user accessible. Internal 4.4 KByte monitor (not user accessible).

SPECTRUM SENSATIONAL PRICE - NOW ONLY

£149.95 INC. VAT

MORE SPECTRUM LOW PRICES

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A few examples from our

SOFTWARE Selection

from independent software houses

THORN EMI

Software for ATARI	Inc. VAT
Submarine Commander	£34.44
Jumbo Jet Pilot	£34.44
Soccer	£29.84
Kickback	£29.84
Home Financial Management	£19.49
Darts	£19.49
Snooker & Billiards	£19.49
Pool	£19.49
Cribbage & Dominoes	£19.49
Cupute 4 & Reversi	£14.89
Mutant Herd	£24.25
Software for Commodore	
River Rescue	£25.24
Vic Music Composer	£25.24

GEM

Software for ZX81, Dragon and Spectrum	Inc. VAT
Monster Mine (for ZX81)	£4.95
Monster Mine (for Spectrum)	4.95
Monster Mine (for Dragon)	7.95
Space Mission (for ZX81)	£4.95
Space Mission (for Spectrum)	£4.95
Space Mission (for Dragon)	£7.95
Dragon Golf	£7.95
Dragon Character Generator	£9.95

SALAMANDER

Games for Dragon 32	Inc. VAT
Dragon Trek	£9.95
Wizard War	£7.95
Vulcan 0	£7.95
Games Compendium DI	£7.95
Golf	£7.95

RABBIT

Software for Commodore VIC20	Inc. VAT
Space Storm	£6.99
Ski Run	£4.99

Dune Buggy	£4.99
Super Worm	£4.99
Jungle	£4.99
Cosmic Battle	£4.99
Frogger(3K)	£4.99
Rabbit Functions	£4.99
Code Breaker	£4.99
Night Fight (3K)	£4.99
Rabbit Writer (16K Cassette)	£19.99
Rabbit Base (16K Cassette)	£14.99
Myriad (3K)	£9.99
Charset/20 (3K)	£4.99
Skramble	£9.99
Space Phreeks	£9.99
Night Crawler	£9.49
Hopper	£9.99
Tank War	£7.99

KUMA

Software for Sharp	
Electron 22622	£9.20
Cribbage	£12.08
Adventure	£12.08
Chess	£16.68

AUDIOGENIC

Programs for VIC-20	Inc.VAT
Amok	£6.95
Alien Blitz	£7.95
Golf	£7.95
Spiders of Mars	£19.95
Sattelite & Meteorites	£19.95
Bonzo	£7.95
Trashman	£19.95
Boss	£14.95
Tank Attack	£19.95
Word Craft	
Word Processing package	£125.00

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



ACCESSORIES

SANYO Colour Monitor
CDD3125N
£228.85

SANYO	Inc. VAT
SANYO 12" green monitor	£90.85
Slim 3G Cassette Recorder	£29.95
C12 Cassettes	£0.50
Single sided double density disks (Box of 10)	£21.25
Double sided, double density disks (Box of 10)	£33.81
Disk head cleaner	£16.10
Single part 11" x9½" printer paper, box of 2,000 sheets	£13.05
VIC Accessories from Viscount	
Motherboard without Buffer	£24.95
Motherboard with Buffer	£29.90
16K RAM Pack	£43.95
32K RAM Pack	£66.95
64K RAM Pack	£114.94
Currah ChatterboxVoice Synthesiser	£57.45

Now with **48K RAM** and still at the same LOW price!

ATARI 800

Now this proven and tested machine has been upgraded to a massive **48K RAM** and its still at the amazing **LOW** price of**£399.99** from **SPECTRUM.** It's an ideal Home Micro for graphics, educational and personal finance etc. use it and it will take you from learning up to a small business use. You can add printers, program recorders, disk drives and more, to expand your micro as and when you want, to suit your needs. So if you're looking for a top of the line micro you must see the **ATARI 800** with **48K** at **SPECTRUM - NOW!**



Spectrum Price

£399.99 INC. V.A.T.

SPECTRUM FACTS

Maximum user RAM	37,899 Bytes
Text Screen	24 × 40
High Resolution	320 × 192
Cassette Lead	Needs own Recorder

ATARI 400

16K RAM



NOW ONLY £159.95 INC. VAT

BASIC cartridge extra

£39.99 inc. VAT

(£34.77 ex. VAT)

SPECTRUM FACTS

Maximum user RAM	13,323 Bytes (with basic Cartridge)
Text Screen	24 × 40
High Resolution	320 × 192
Cassette Lead	Needs own Recorder

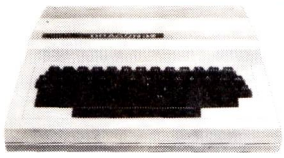
ATARI DISK DRIVE
£299.00 INC. VAT

ACCESSORIES, BOOKS & GAMES for ATARI

Accessories	INC VAT
Thermal Printer	£198.95
16K RAM Pack	£65.00
400 Keybcard	£59.95
32K RAM board (400/800)	£75.00
48K RAM board (400/800)	£99.00
Paddles (Pair)	£13.99
Joysticks (Pair)	£13.99
I/O Cable	£12.99
Printer Cable	£28.50
Monitor Cable	£25.00
Thermal Paper	£4.00
Pointmaster Joysticks	£14.95
Quickshot Joysticks	£14.95
Keyboard for Atari 400	£00.00
Books & Manuals	
Wiley Manual	No VAT
Basic Reference Manual	No VAT
DOS. 2 Manual	No VAT
Operating System Listing	No VAT
DOS. Utilities Listing	No VAT
Home Computer Programs – Home/Office	
Word Processor (Disk)	£99.99
Mortgage & Loan	£14.99
Microsoft Basic (Diskette)	£59.99
Home Study (Cassette except where stated)	
INV. to programming 1	£19.99
INV. to programming 2	£22.99
INV. to programming 3	£22.99
Conversational French	£39.99
Conversational German	£39.99
Conversational Italian	£39.99
Conversational Spanish	£39.99

	INC VAT
European Countries & Caps	£14.99
Hangman	£14.99
Kingdom	£14.99
States & Capitals	£14.99
Touch Typing	£19.99
Music Composer (Cartridge)	£35.99
Home Entertainment (Cartridge except where stated)	
Galaxian	£29.99
Defender	£29.99
Asteroids	£29.99
Basketball	£24.99
Blackjack (Cassette)	£14.99
Caverns of Mars (Disk)	£29.99
Centipede	£29.99
Computer Chess	£24.99
Missile Command	£29.99
PAC Man	£29.99
Space Invaders	£29.99
Star Raiders	£29.99
Cribbage & Domino	£19.95
European Scenic Jig-saw	£19.99
Programming Languages & Aids	
Assembler Editor	£39.99
Atari Basic Cartridge	£39.99
Macro Assembler (Disk)	£59.99
Pilot (Consumer)	£59.99
Pilot (Educator)	£89.99
Entertainer Kit (Star Raiders Missile Command & Pair Joysticks)	£69.99
Programmer Kit (Basic Cartridge & Manuals)	£39.99

DRAGON



Spectrum Price £199.95

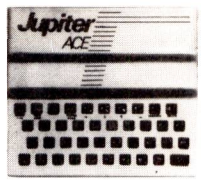
VISCOUNT Teach yourself Dragon Basic . £6.95

Unbelievable value from SPECTRUM! Extensive facilities include highly advanced colour graphics. Powerful standard 32K RAM (expandable to 64K Bytes). ● 9 Colour 5 resolution Display ● Extended Microsoft colour BASIC (as standard) ● Advanced sound with 5 octaves - 255 tones

SPECTRUM FACTS

Maximum user RAM	29,679 Bytes
Text Screen	16x32
High Resolution	256x192
Cassette Lead	Included

JUPITER ACE



SPECTRUM FACTS

Maximum user RAM 1,000 Bytes approx.

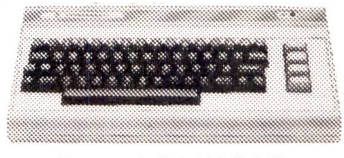
Outstanding value-for-money! The **JUPITER ACE** uses easy to understand FORTH language. **3K RAM EXPANDABLE to 19K. Full moving keyboard** with auto repeat and caps lock. **Full sound and chunky graphics.**

Spectrum Price £89.95

HI-TECH Software for JUPITER

Memory Stars	£5.99
Cavern Attack	£5.99
Micro Maze	£6.50
Space Battle	£4.50
Ace Invaders	£5.50
Green Cross Frog	£4.80

COMMODORE 64



Powerful 64K RAM

40-colour displays to monitor TV. High resolution graphics and 3-dimensional effect capability, music synthesiser. Z80 additional processor option.

Spectrum Price

£345.00 INC. VAT

VIC 20
Spectrum Price £129.90

SPECTRUM Special!
AMAZON Business Software for **ATARI 800** at less than **HALF PRICE!**
Key Account **ONLY £69.00**

Key Word **ONLY £69.00**

Spectrum Computer Centres have no connection whatsoever with the ZX-Spectrum Computer manufactured by Sinclair Research Ltd.

There's a Spectrum Centre near you . . .

ABERYSTWYTH
AberData at Galloways, 23 Pier St. 0970 615522

ABINGDON
Ivor Fields Computers, 21 Stert St. 0235 21207

ACCRINGTON
PV Computers, 38A Water St. 0254 36521/32611

ALDERSHOT
David Saunders Computer Centre, 51 Station Rd. 0252 20130

ALFRETON
Gordon Harwood, 69/71 High St. 0773 832078

BANBURY
Computer Plus, 2 Church Lane. (0295) 55890

BARROW-IN-FURNESS
Barrow Computer Centre, 96 Church St. 0229 38353

BASILDON
Godfrey's, 28-32 East Walk, Town Centre. 0268 289379

BASINGSTOKE
Fisher's, 2/3 Market Place. 0256 22079

BATH
Software Plus, 12 York St. 0225 61676

BEDFORD
Stanad Ltd., 115 Midland Rd. 0234 49341

BELFAST
Arthur Hobson Ltd., 37 Great Victoria St. 0232 246336

BIRMINGHAM
Sherwoods, Great Western Arcade. 021 236 7211

BOSTON
Fotosound Computers, 19 Dolphin Lane. 0205 64781

BRADFORD
Photosave, 18 Cheapside. 0274 308598

BRIGHTON
Capricorn, 1 Queens Rd. 0273 29634

BRISTOL
Brensal Computers Ltd., 24 Park Row. 0272 294187

BURNLEY
IMO Computer Centre, 39-43 Standish St., 0282 54299

BURY (Lancs.)
Micro-North, 7 Broad St. Tel. 061-797 9764

BURY ST. EDMUNDS
Bury Computer Centre, Tel. 061-797 9764

CAMBERLEY
Camera Arts (Micro Computer Division), 36 High St. (0276) 65848

CAMBRIDGE
KP Ltd., 12a Kings Parade. 0223 68087

CANTERBURY
Kent Micro Systems, Conquest House, 17 Palace St. 0227 50200

CARDIFF
Randall Cox, 18-22 High St. Arcade. 0222 31960

CHELMSFORD
Maxton Hayman Ltd., 5 Broomfield Rd. (0245) 354595

CHESHAM
Reed Photography & Computers, 113 High St. 0494 783373

COVENTRY
Coventry Micro Centre, 33 Far Gosford St. (0203) 58942

CREWE
Microman, 123 Nantwich Rd. Tel. TBA

CROYDON
Cadcom Ltd, 96 Whitgift Centre (Next door to MacDonald's) 01-686 8393

DARLINGTON
McKenna & Brown, 102 Bondgate. (0325) 59744

DERBY
C T Electronics, at **Camera Thorpe,** The Spot. 0332 44760

DUMFRIES
Vennals, 71 English St. 0387 4547

DUNSTABLE
Dormans, 7-11 Broad Walk. 0582 65515

EDGWARE
Breaker 1-4, 130 High Street, 01-952 7488/8860

EDINBURGH
Edinburgh Computers-at Edinburgh Cameras, 51-57 Lothian Rd., 031 229 4416

EDINBURGH
The Silicon Centre, 6-7 Antigua St. 031 557 4546

EVESHAM
Tecnicare, The Lodge, Brickiln St., 0386 41484

EXMOUTH
Open Channel, 30 The Strand, 03952 4408

GLASGOW
Victor Morris Ltd., 340 Argyle St. 041 221 8958

GLOUCESTER
The Model Shop, 79-81 Northgate St. (0452) 410693

GRIMSBY
R. C. Johnson Ltd., 22 Friargate, Riverhead Centre. 0472 42031

GUERNSEY
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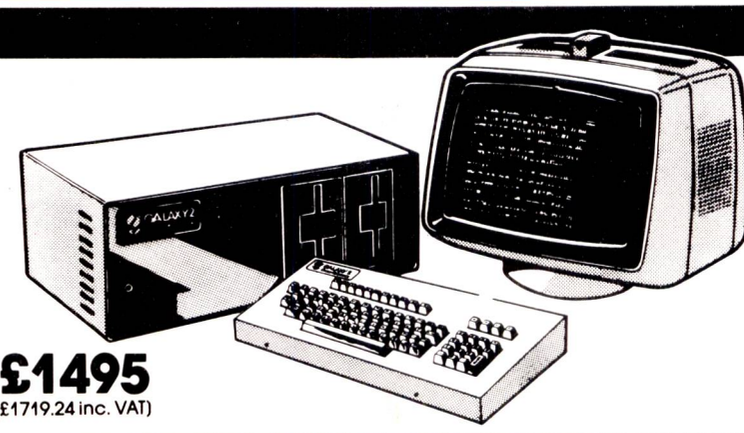

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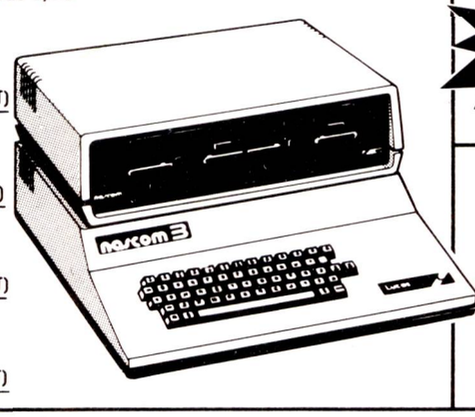

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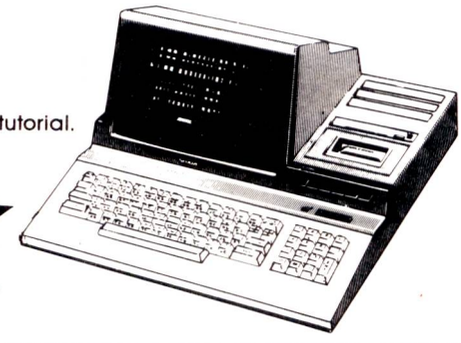

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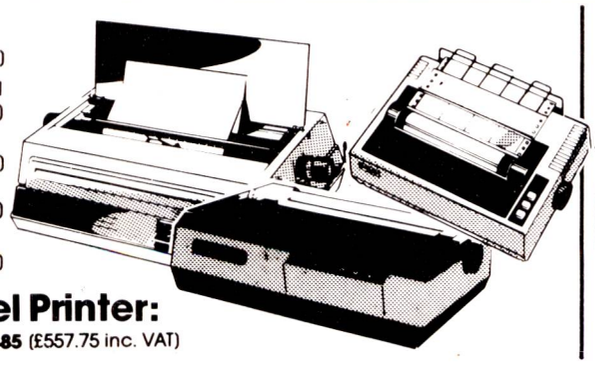

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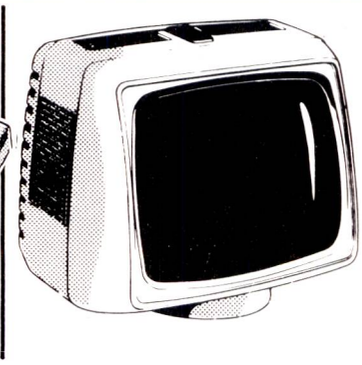

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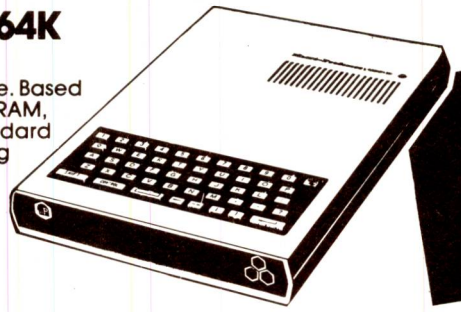

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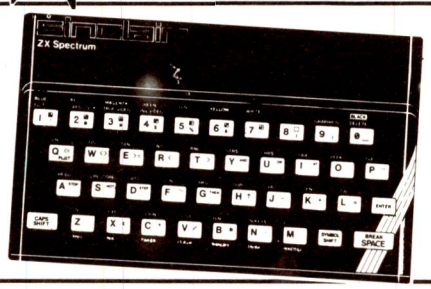

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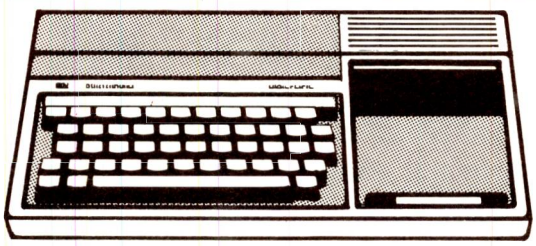

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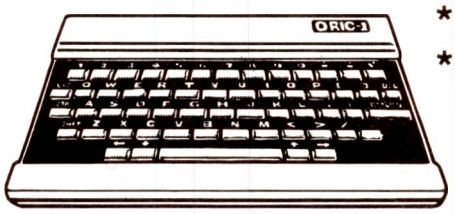

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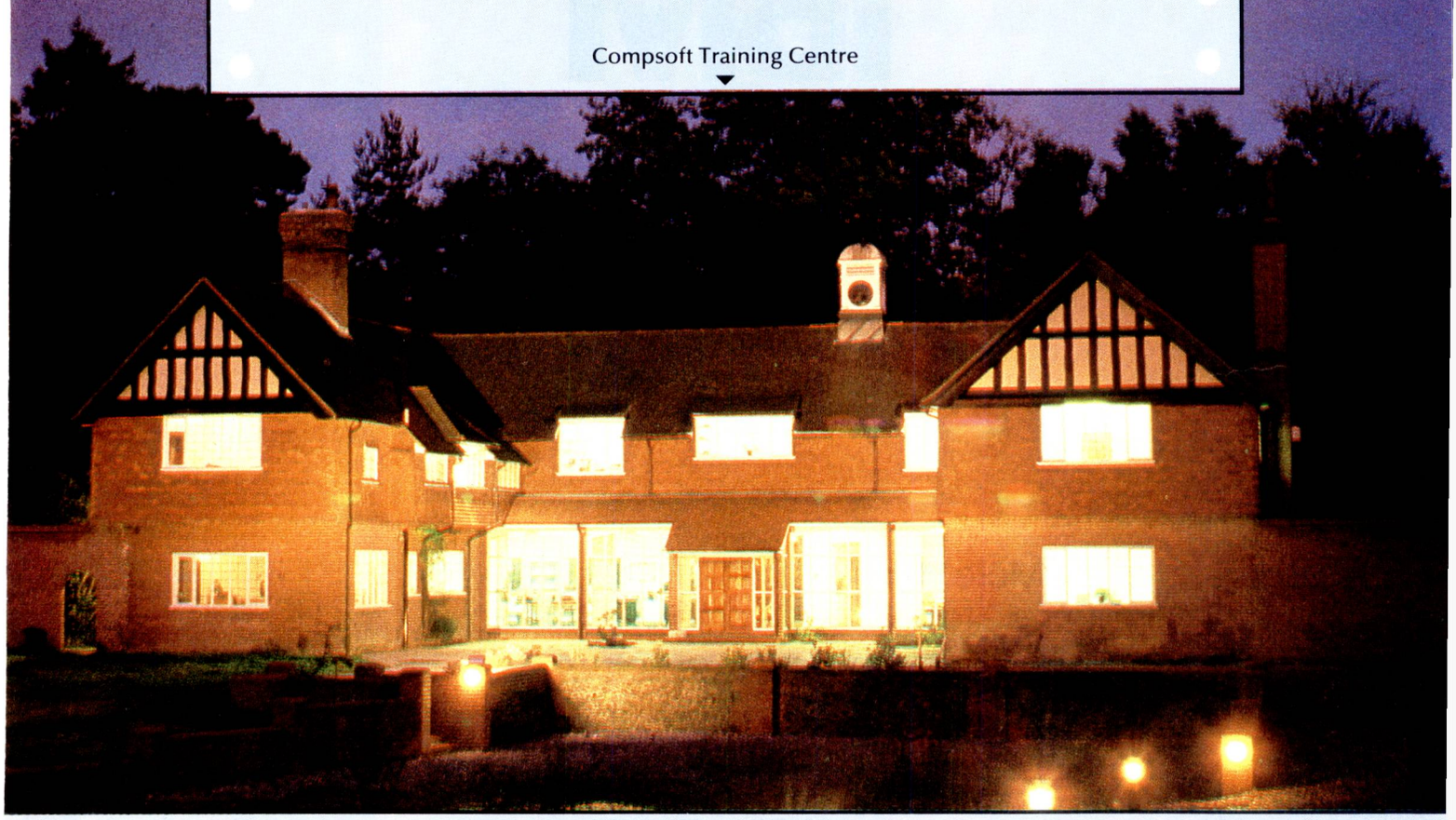

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The Ricoh FLOWRITER

Three out of every four computers going into schools are BBC Micros. Is there a lesson to be learned by every user?

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

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

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

The BBC's choice too.

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

All this for only £399.

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

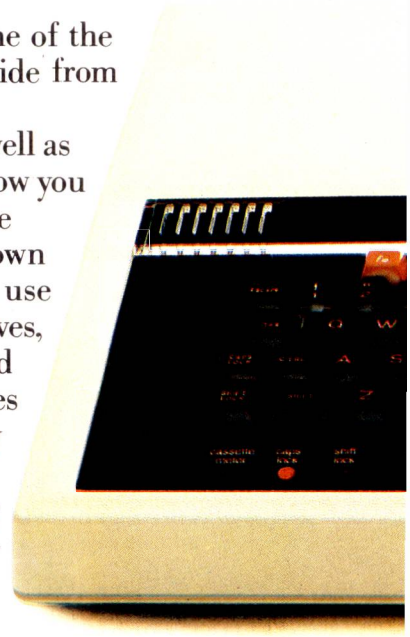
The most sophisticated version (called Model B) is available for only £399. (There is also a basic model available, the Model A, at £299.)

Designed to grow.

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

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

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



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

The Tube. A unique feature.

The Tube, which is unique to the BBC Micro, provides for the addition of a second processor via a high speed data channel. The possibilities are enormous. For example, the addition of a second

3MHz 6502 processor with 64K of RAM doubles processing speed. While a Z80 with 64K of RAM opens the door to a fully CP/M* compatible operating system, with all the benefits for business applications.

Linking up with other computers.

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

Make full use of Prestel & Teletext.

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

BASIC plus.

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

*Trademark of Digital Research.



A full range of software.

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

The best possible back-up.

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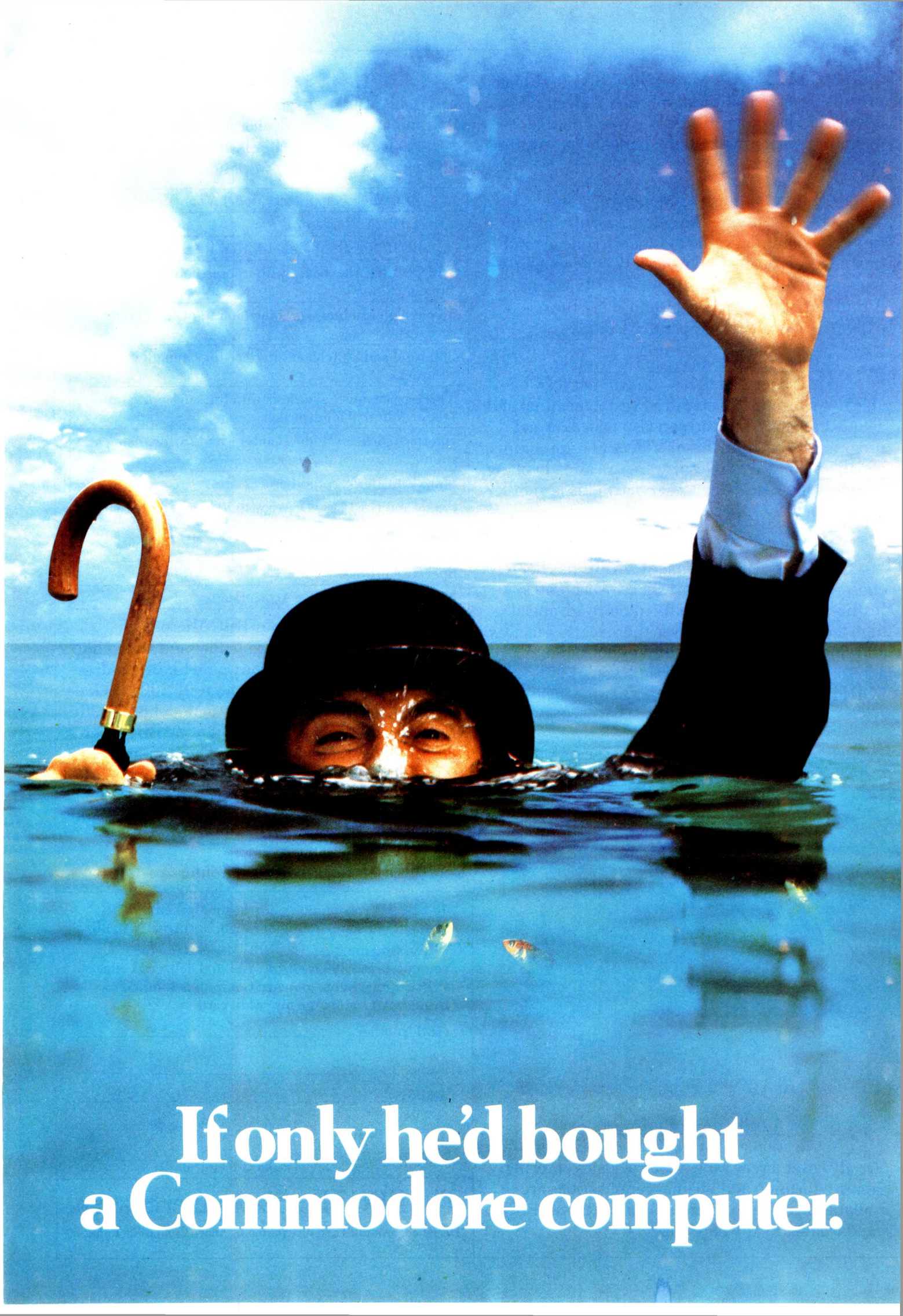
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Processor: 16-Bit 8086, cycle time 215 Nano Seconds. **Architecture:** DMA Bus based, true 16-Bit. **Speed:** DMA @ 6MB/sec; Disc transfer @ 3MB/sec. **Memory (RAM):** 128KB standard, expandable to 640KB. **Screen:** High resolution green; anti-glare optical filter. Colourgraphics optional extra. **Discs:** Two 8" DS/DD giving 2.36 MB usable. IBM compatible. **Interfaces:** 2 RS 232 communications interfaces. Plus: Centronic printer interface. **Operating Systems:** MS-DOS CP/M-86. 8-bit software emulator. **Languages for 16-bit:** Basic, Cobol, Pascal, Fortran, PL/1, BCPL compilers and interpreters available. **Customising:** with logo, namestyle and house colours, can be arranged. **"So simple to operate" – and don't forget, the S16-bit Mega Micro is built to military standards with laboratory-level quality control for complete dependability.**

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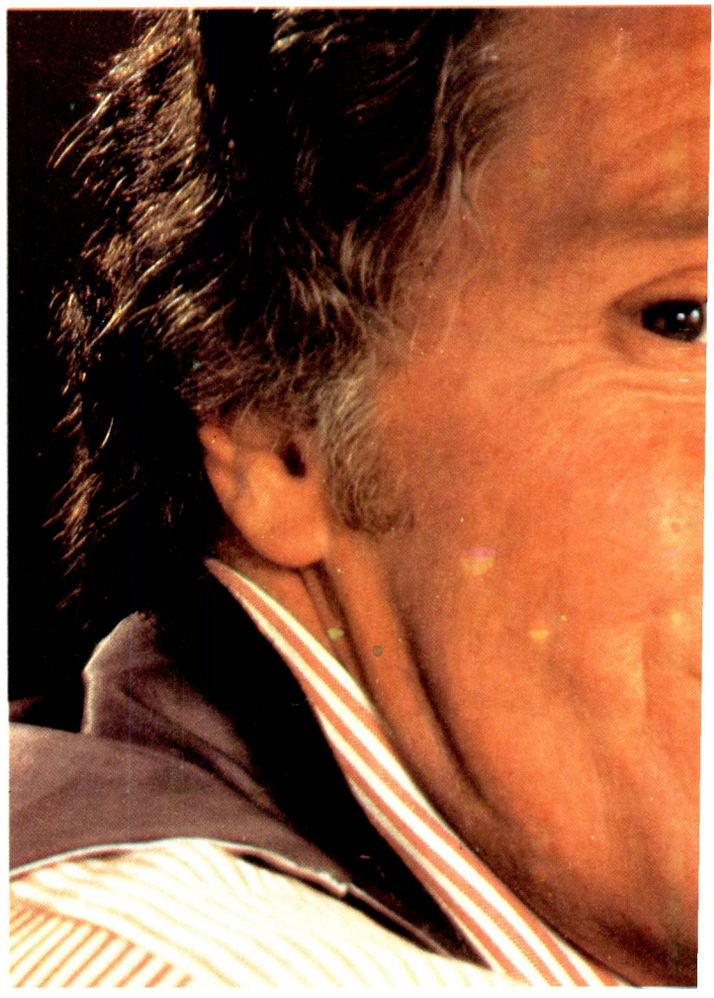

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Now, when nobody's looking, nonchalantly tape it to your terminal, just under the "IBM," as if it really belonged there.

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And you can use dBASE II interactively for answers right now. Or save your instructions, then repeat everything with two words: DO Manhours, DO Project X, DO whatever has to be done.

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Instead of just poring over a manual, you can check out dBASE II by running it on your own system free for 30 days.

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Ashton-Tate

dBASE II™

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

MEMORY

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

THE SCREEN DISPLAY

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

CHARACTER SET

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

GRAPHICS

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

SOFTWARE

Enhanced ANSI BASIC; screen editor (32 commands); mathematics package (10 significant figures); graphics commands.

- a very friendly screen editor – a delight to use and readily adapted to text processing;
- arithmetic to 10 significant figures;
- very controllable output formatting of numbers – invaluable for accounting, statistics, and scientific applications;
- a powerful, much enhanced BASIC;
- a very flexible operating system, which allows any data stream to be opened to any device.

INTERFACES

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

KEYBOARD

- standard typewriter pitch, action, layout and size, with editing control and graphics keys.



*CP/M IS A REGISTERED TRADE MARK OF DIGITAL RESEARCH INC.

You can get everything in the box on the

If you understand the facts and figures on the left you'll soon realise that NewBrain has to be one of the most powerful micros around.

However, if you find the box on the left a little hard to follow, don't worry.

We've got over 120 dealers nationwide who've got all the answers at their fingertips.

Either way you'll discover that NewBrain is the kind of micro that will stop the competition getting a look in.

At £269 it starts off with twice as much memory as most of its competitors and can expand to over thirty times that amount. So there's no chance of being left behind in the micro race.

It comes with a very powerful language (enhanced ANSI BASIC) and it'll take CP/M;* so it'll work on the same system as similar big business micros, giving you the capacity to use an almost limitless variety of tried and tested software.

But most of all NewBrain is a machine that can expand.

It's designed to take disks, printers and memory expansion modules (up to 2M bytes) plus anything else you'd expect a professional business micro to handle.

So, whether you understand the box on the left or not, pay a visit to someone in the know on the right.

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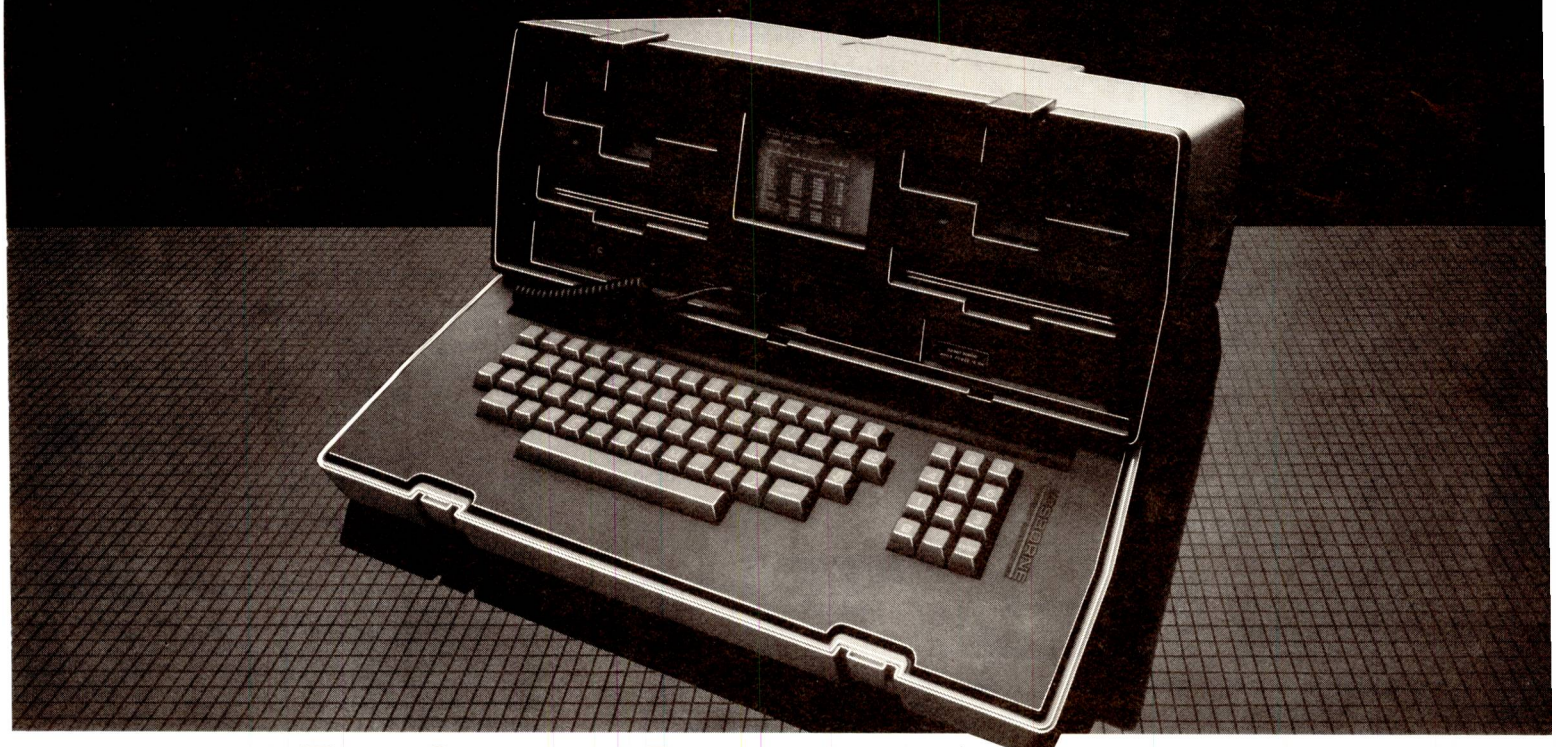

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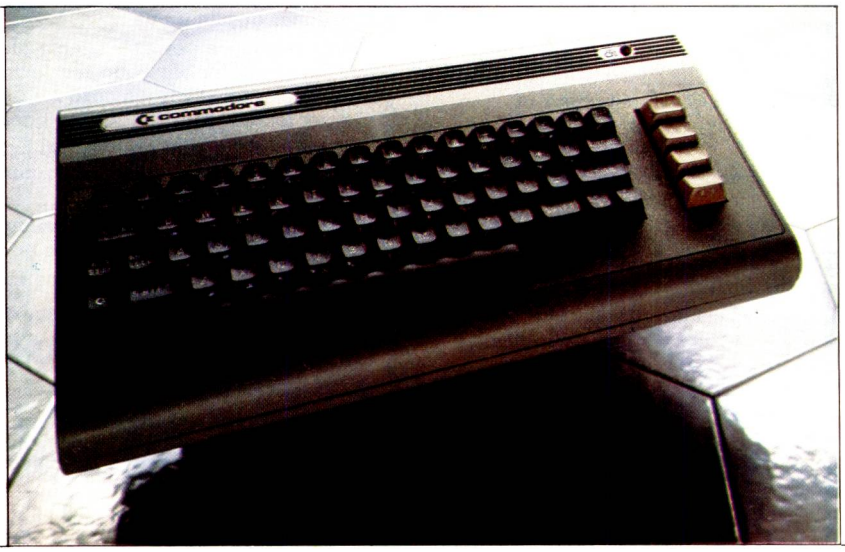

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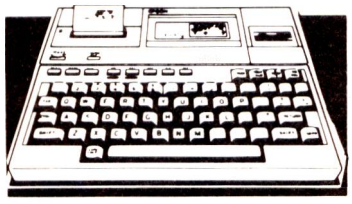

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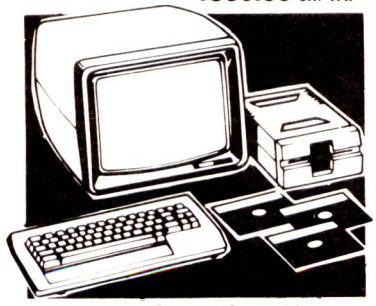

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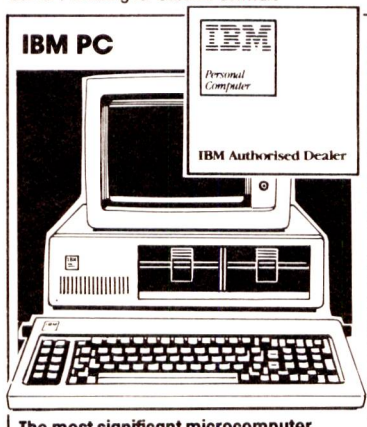

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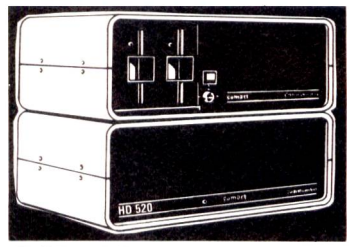

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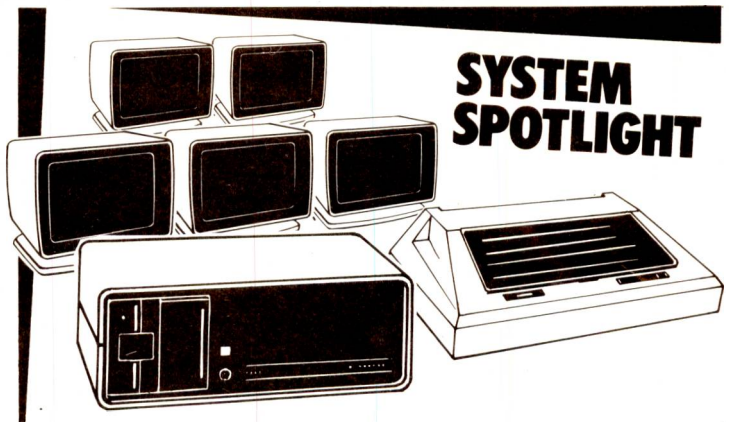

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(CP 520MP £6995 ex. VAT)

SPECIFICATION: Comart CP520MP featuring CP520 Multi Processing Communicator System c/w 1 x Z80A main and 5 x Z80A slaves, 64K Byte main memory + 5 x 64K Bytes, 1 x 790K Byte Diskette Drive + 1 x 5" 20 Mega Byte Winchester Disk Drive, 12 Serial & 6 Parallel Interfaces. Inc. CP/M & Multi processing system software, £6995. Our Special Package includes CP520MP with 5 x WY100 Display Terminals and an Anadex 9501A Dot Matrix Printer

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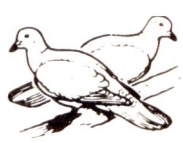

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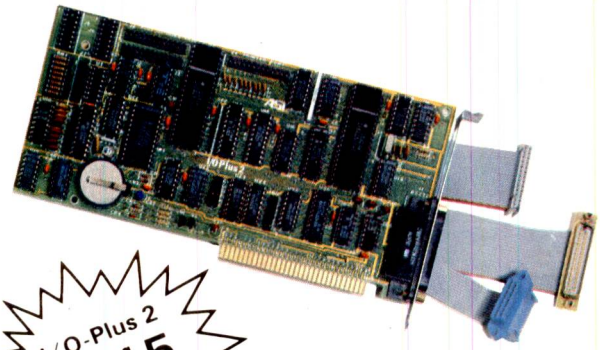
*The OCTET-KSR and MSR typewriter interfaces are sold exclusively by BRITISH OLIVETTI and their distributors. Please contact your local agent for further details.



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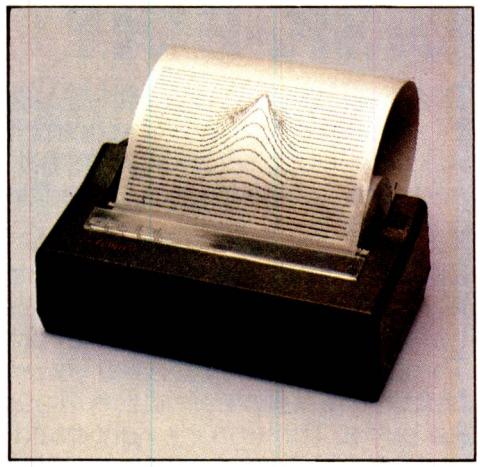

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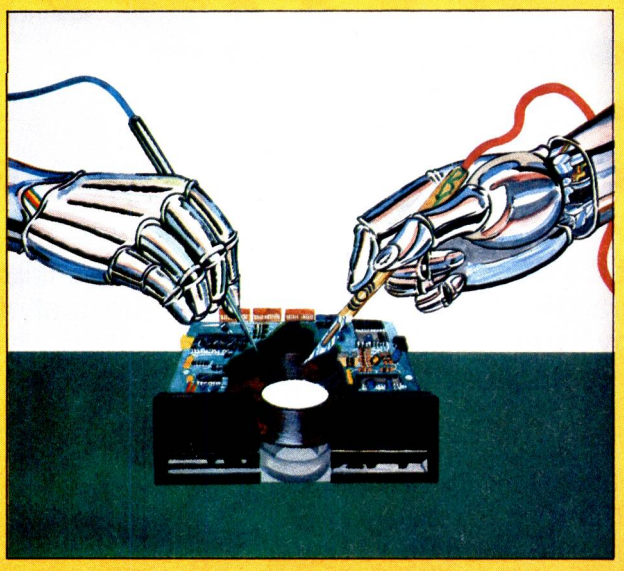

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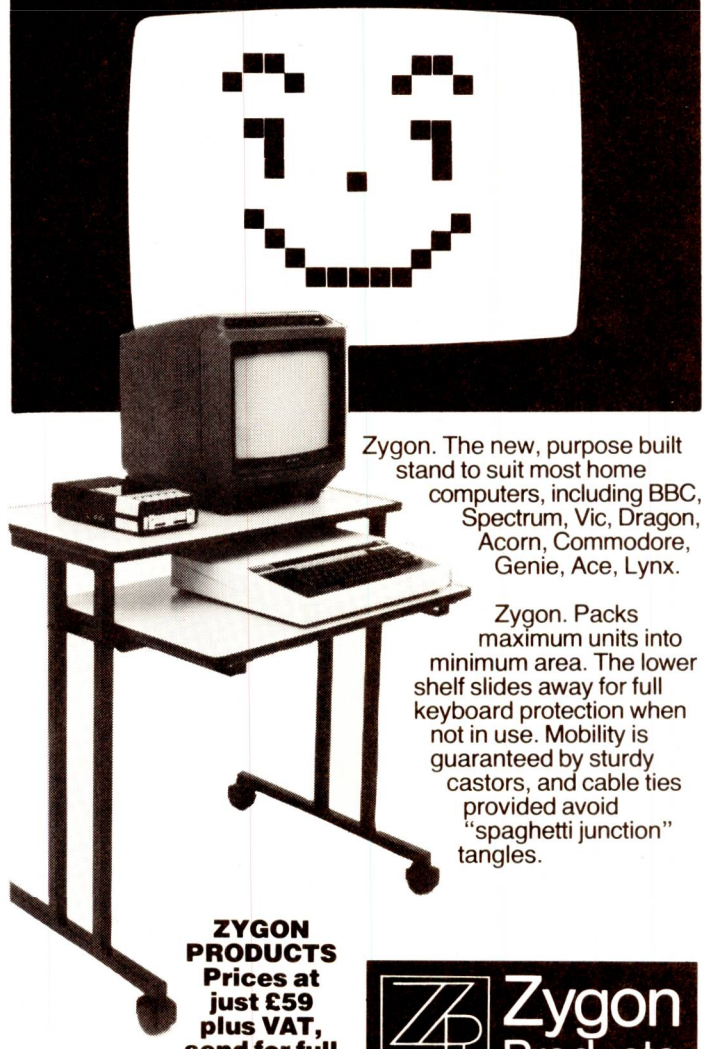

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FMS-80, 81, 82	DJR Assoc	□		
INFOSTAR	MicroPro	□		
PERSONAL PEARL	Pearl Software	□		
REPORTSTAR	MicroPro	□		
RESCUE	MBS	□		
Business Systems, Financial Planning, Accounting				
CALCSTAR	MicroPro	□		
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MULTIPLAN	MicroSoft	□		
SAPPHIRE MARS	Sapphire Systems	□	●	
SUPERCALC	Sorcim	□	●	*
MILESTONE	Organic Software	□	●	
GBS/(General Business System)	ByteSoft	□		
ISL (Integrated Stock & Ledger)	ByteSoft	□		
Statistics				
MICROSTAT	Ecosoft	□		*
Training Packages				
HANDS-ON CP/M	MicroCal	□	●	
HANDS-ON COBOL	MicroCal	□	●	
WP WORKSHOP	MAC	□		
FLIGHT SIMULATOR	MicroSoft			*
Languages				
BASIC COMPILER	MicroSoft	□		
BASIC INTERPRETER	MicroSoft	□		
BAZIC	MicroMikes	□		
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	□	●	
PL/1	Digital Research	□	●	
XBASIC	Xitan	□		

		CP/M-80	CP/M-86	PC-DOS
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ACCESS MANAGER	Digital Research	□		
ANIMATOR	MicroFocus	□	●	
EDIT	MicroSoft	□		
BT-80	Digital Research	□		
DISPLAY MANAGER	Digital Research	□		
FORMS 2	MicroFocus	□	●	
LINK-80, PL1L1B	Digital Research	□		
MAC	Digital Research	□		
MACRO	Microsoft	□		
RMAC, LINK & XREF	Digital Research	□		
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	Digital Research	□	●	
CP/M PLUS	Digital Research	□		
CP/NET & CP/NOS	Digital Research	□		
MP/M II	Digital Research	□	●	
CONCURRENT CPM-86 (IBM PC)	Digital Research		●	
Utilities				
COPYALL	MicroMikes	□		
DESPOOL	Digital Research	□		
FILESHARE	MicroFocus	□		
FILESTAR	MicroSec	□		
MUCOPY	Wheatcroft Hards	□		
SORT	Microsoft	□		
SUPERSORT	MicroPro	□		
SUPERVYZ	Epic	□		
SDISK (Silicon Disk)	Xitan	□		
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BSTMS	Byrom Software	□		
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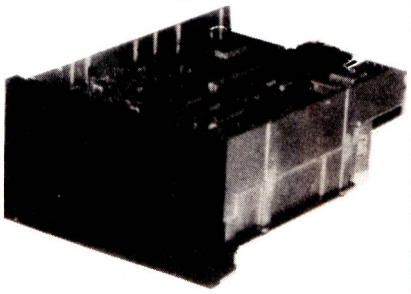

These are high quality, very reliable, industry standard disk drives. These can be used as single sided/single density, double sided/double density or double sided/double density depending on the host computer disk interface. Compatible with most micro-computers e.g. VIDEO GENOE, ATOM, TRS 80, BBC COMPUTER, SUPER BRAIN, NASCOM etc. etc. If used as double sided/double density then the storage capacity is 500 K BYTES/DRIVE (unformatted), track density is 48 TPI and can daisy chain up to 4 drives. 90 day warranty.

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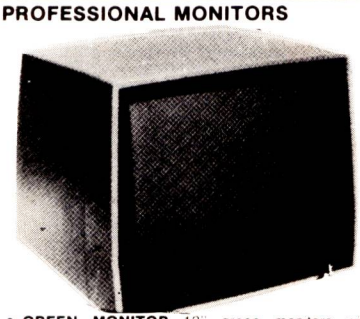

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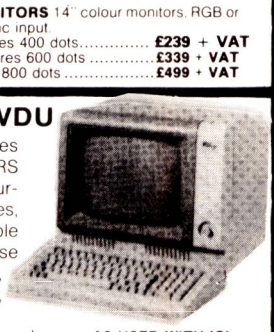

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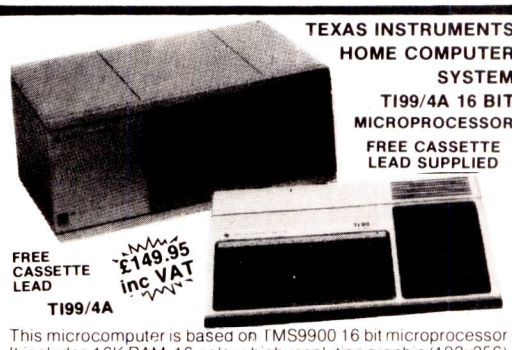

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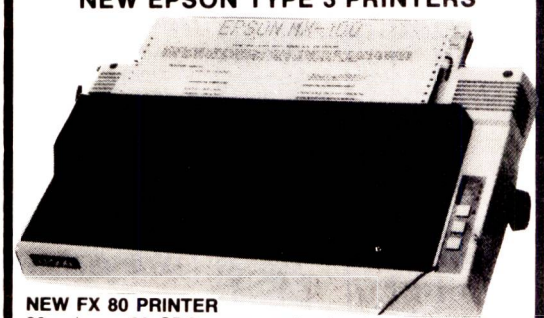

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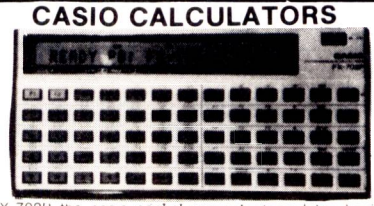

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SEIKOSHA GP SERIES GRAPHIC AND TEXT PRINTERS

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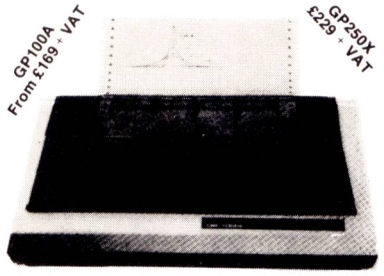

GP-100A 50CPS, 80 column Hi-res graphic line repeat function, adjustable up to 10" paper width, tractor feed, 5 x 7 dot matrix. GP-100A centronic parallel interface.
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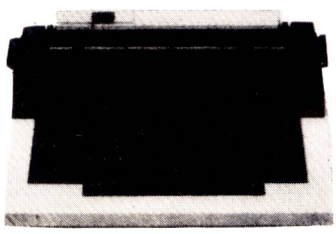

10, 12, 15 characters per inch switch selectable. Changeable daisywheels. 8 to 12 characters per second print speed. Centronics compatible interface internally fitted. Built in self test program. Automatic underliuning, auto repeat, 12 character buffer. Lift off correction ribbon fitted. Film or carbon ribbons. Portable — carrying case supplied. Lightweight, only 21 pounds including case.

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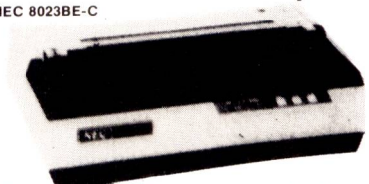
FAST 100 CPS NEC 8023 PRINTER

NEC 8023BE-C



This is a high speed printer using bi-directional logic seeking operation, 7x9 matrix for alphanumerics, 8x8 for graphics and bit image printing. Programmable paper feed, original plus three copies, Greek characters and high resolution graphics. The print quality is exceptional, and the price is affordable.

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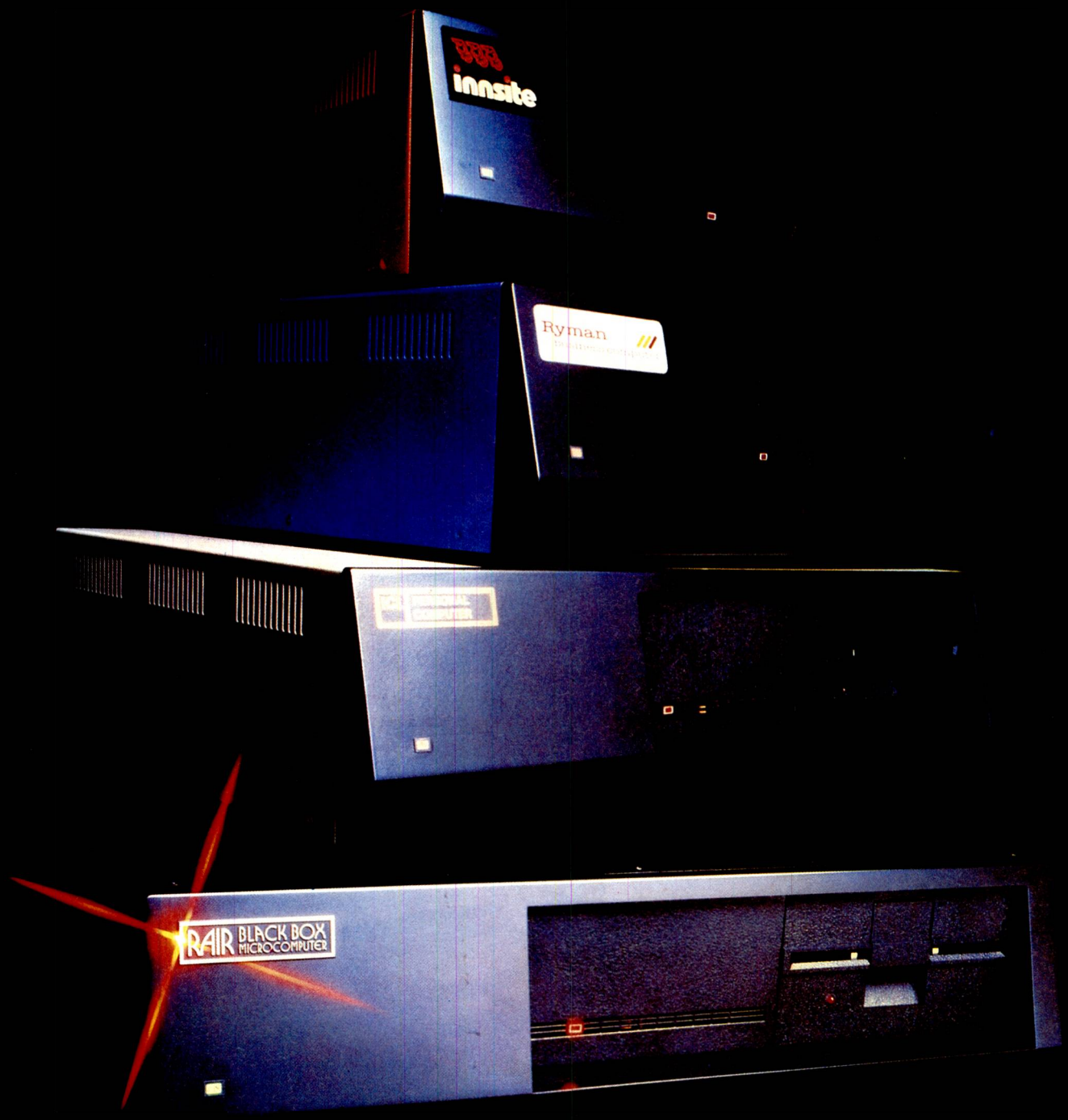

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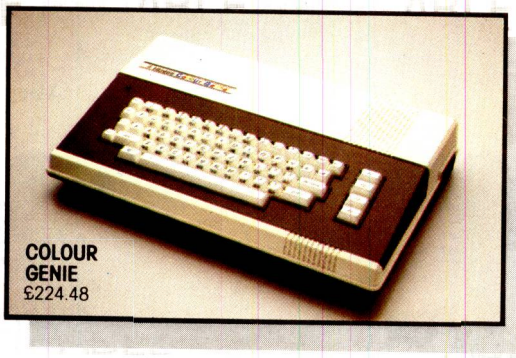

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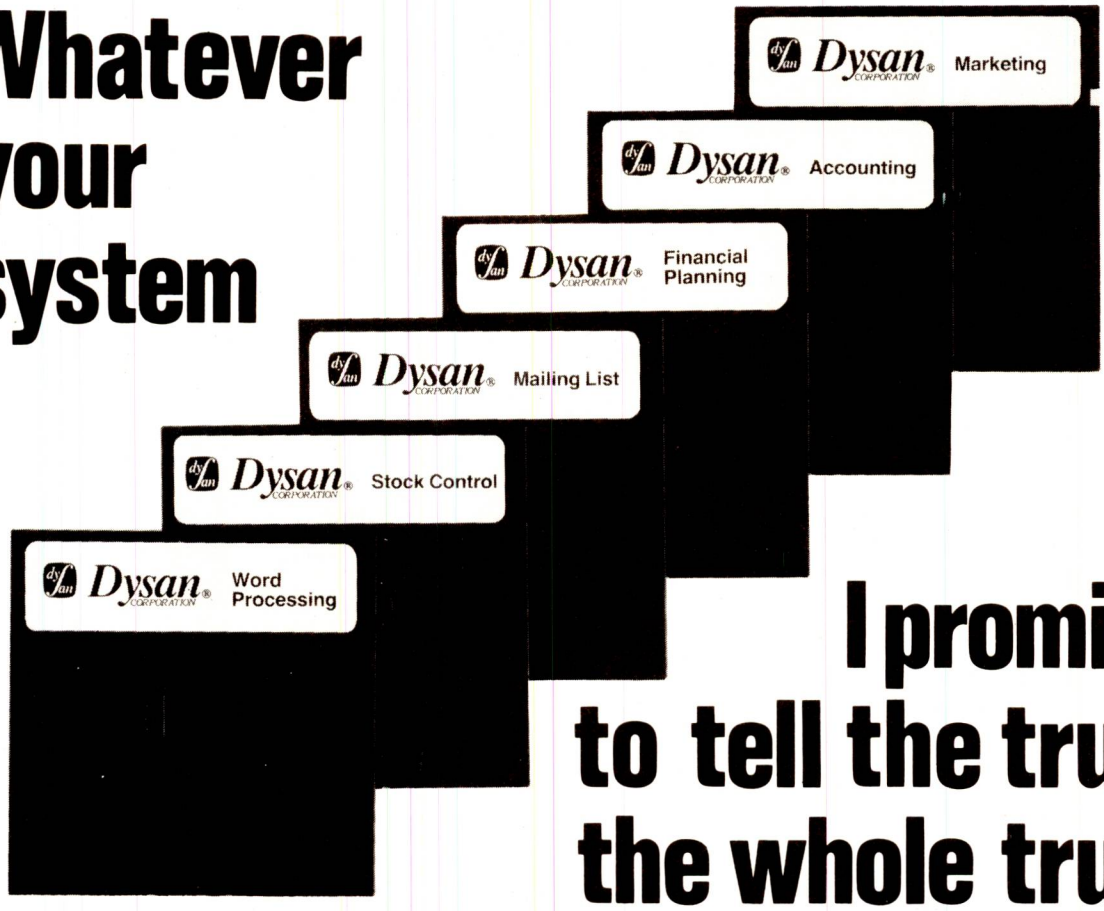

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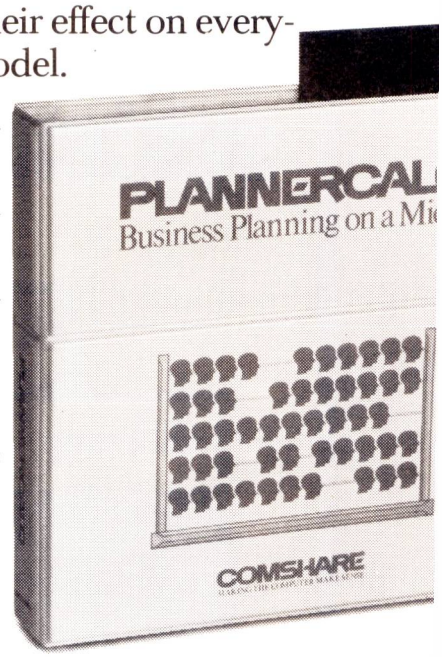

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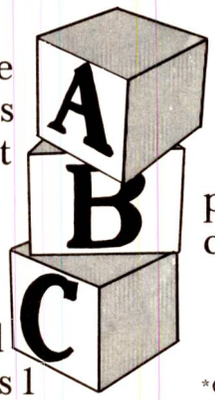

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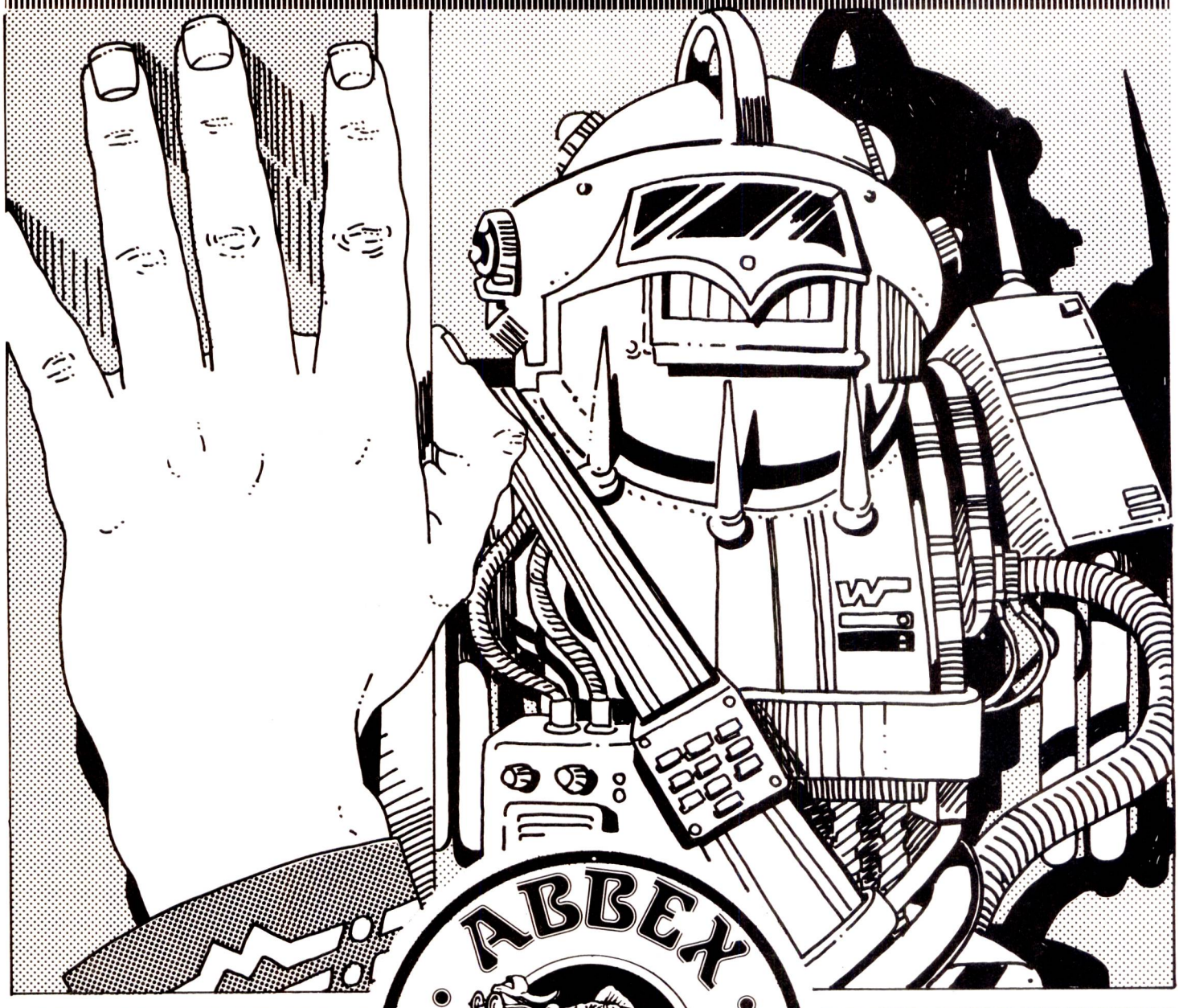

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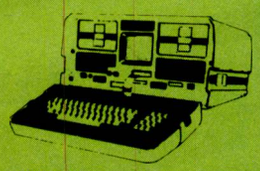

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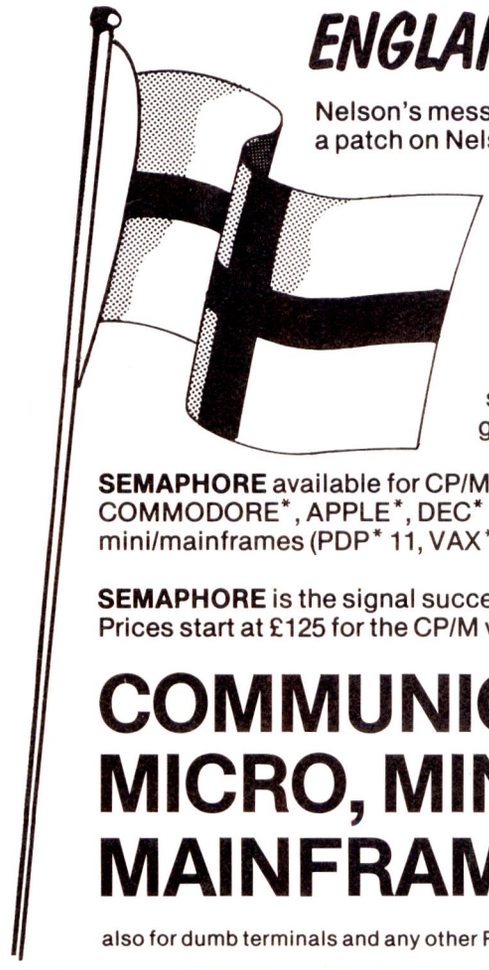

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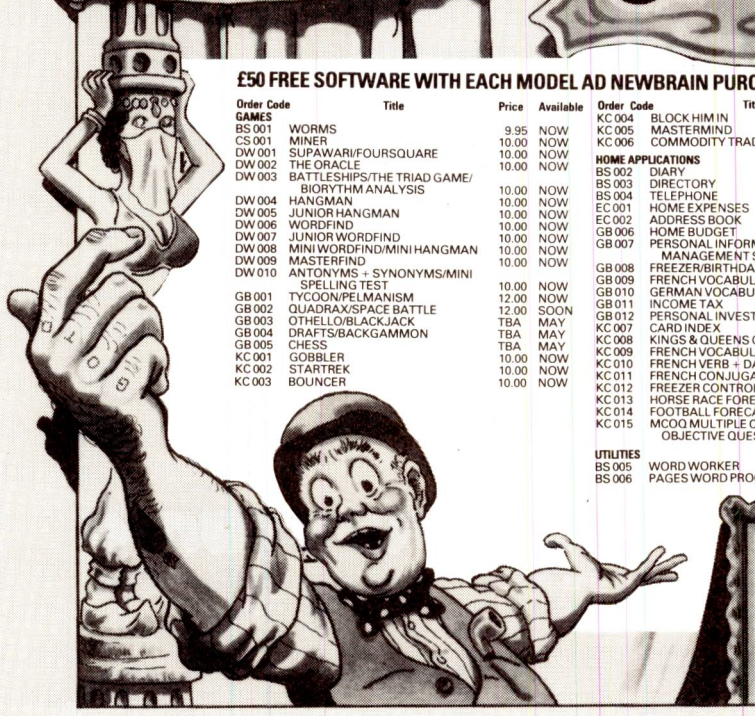

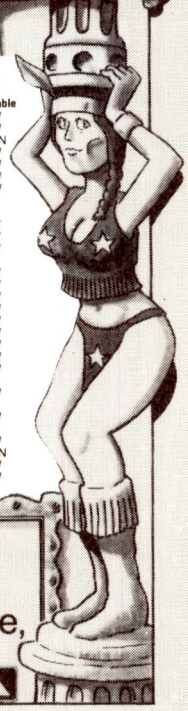

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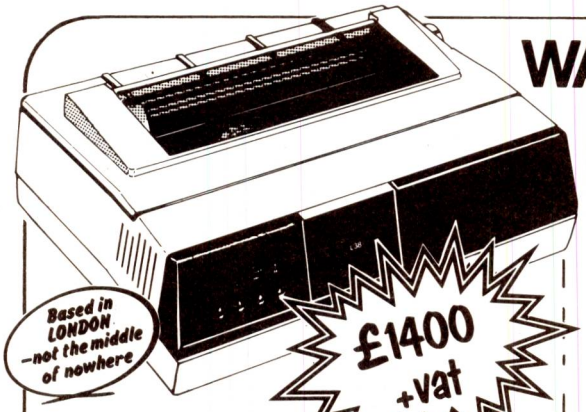

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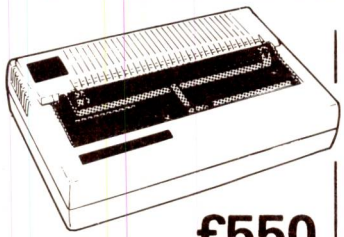

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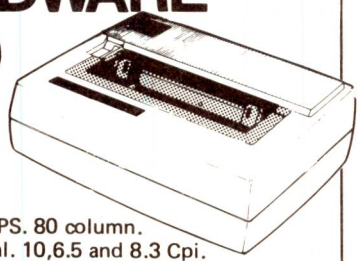

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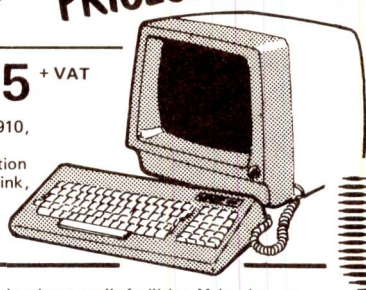

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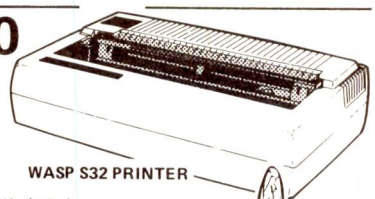

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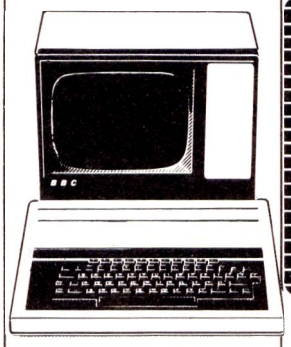

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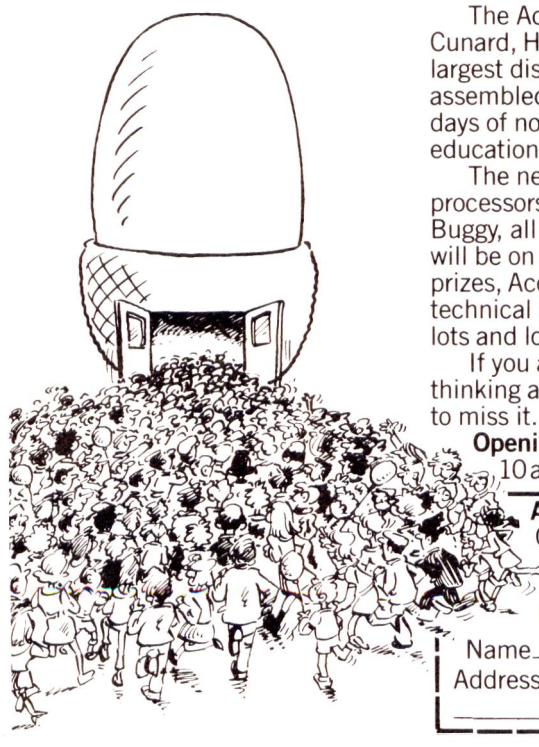

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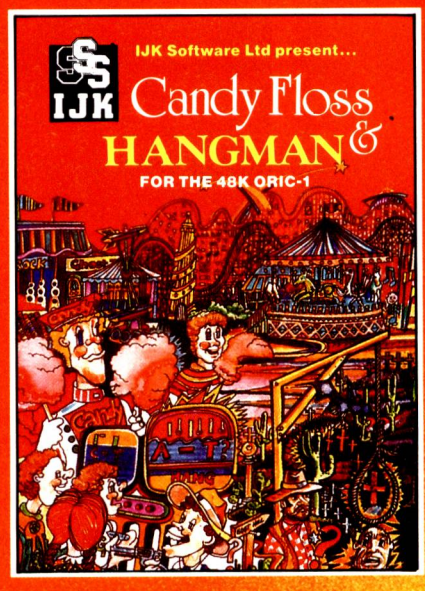

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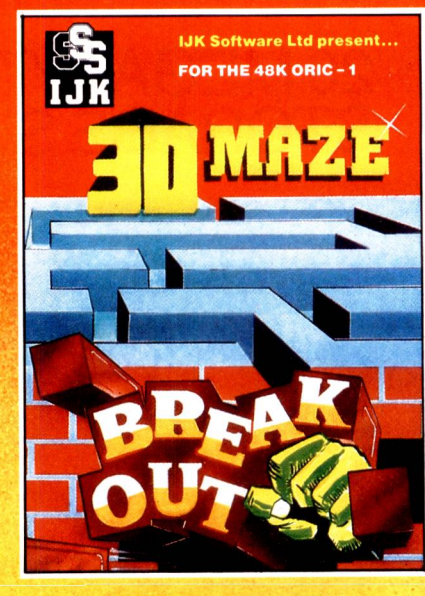



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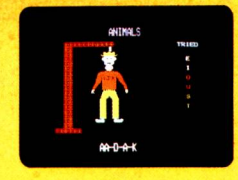



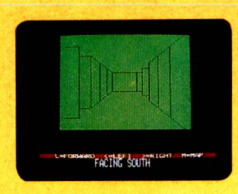

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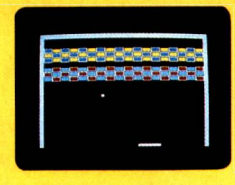

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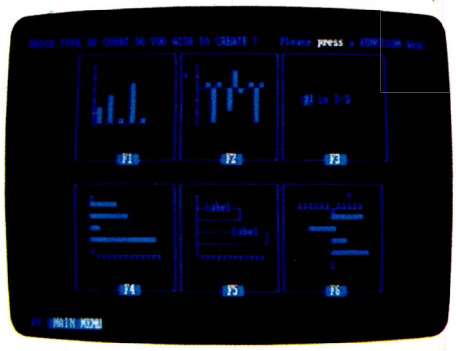

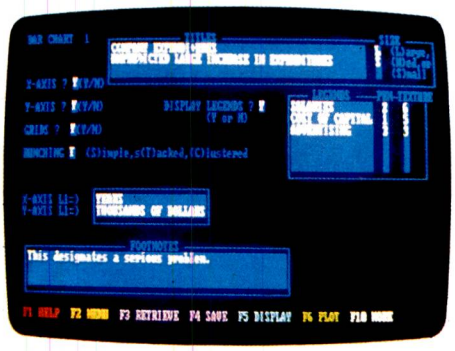

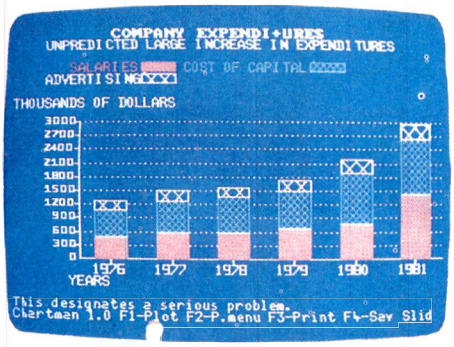

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Saunderson speaking .

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

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We don't ask the size of files or facilities required to get more money out of you but simply so we can recommend the best system for your needs. If you are running many transactions you should seriously consider a hard disk system. It has much greater file capacity and its speed of operation makes floppy disk changing a thing of the past.

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

Sandy Saunderson

Sandy Saunderson is Managing Director of KGB Micros Limited, the fast growing commercial microcomputer company based in Slough. He has extensive knowledge of the microcomputer industry and if you would like to speak to him, either on general computer matters or particularly about his own products at KGB, give him a call on Slough (0753) 38581/38319 or drop him a line at KGB Micros Limited, 14 Windsor Road, Slough SL1 2EJ.

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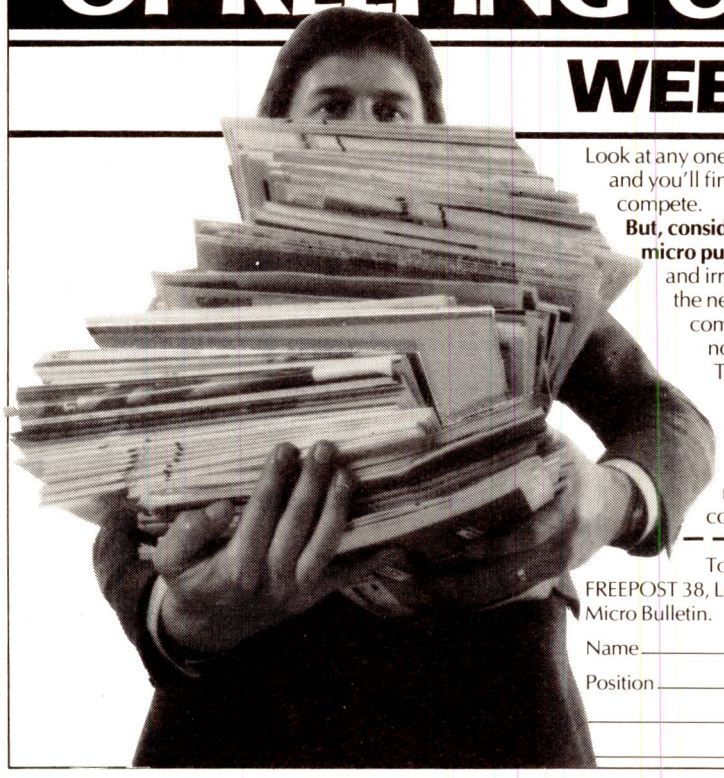

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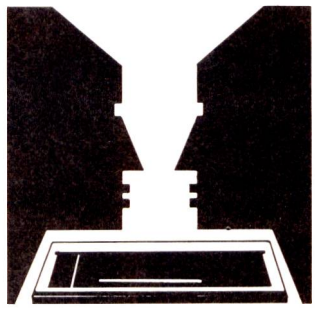

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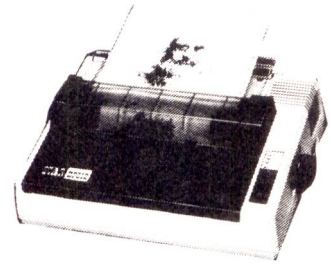

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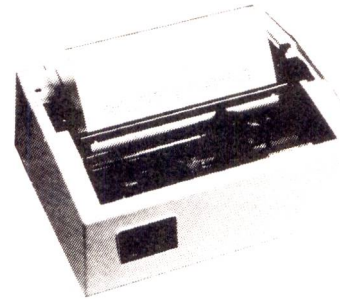

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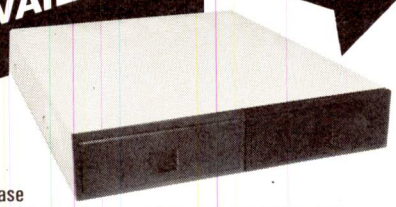

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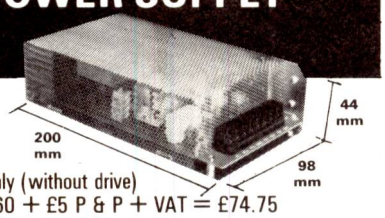

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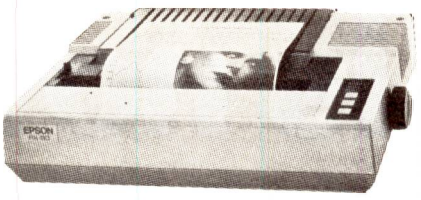

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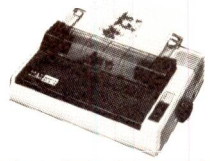

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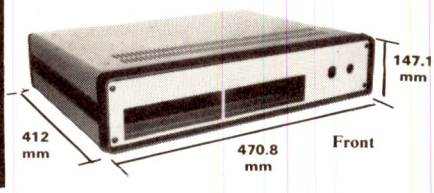

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Back

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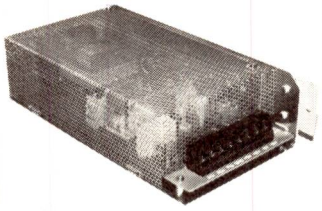

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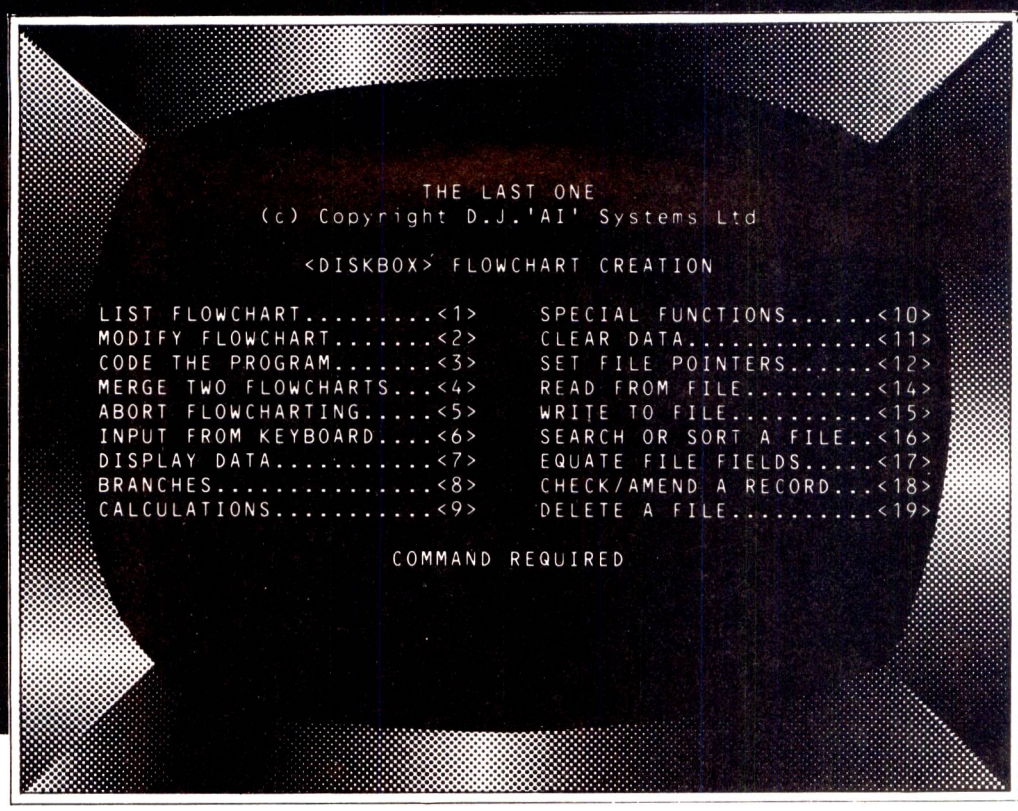

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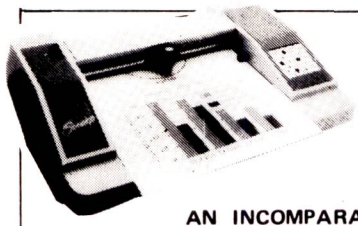

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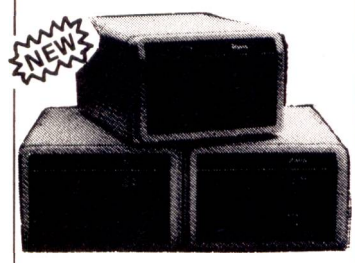

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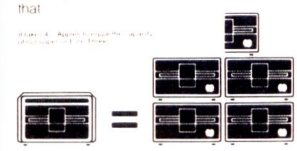

The Elite Two offers an impressive 326K bytes and 40 tracks on each side. This drive is making a real hit with users who need extra storage, but don't require top-of-the-line capacity.

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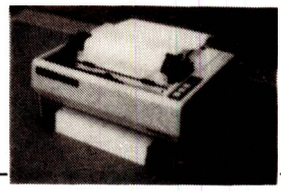

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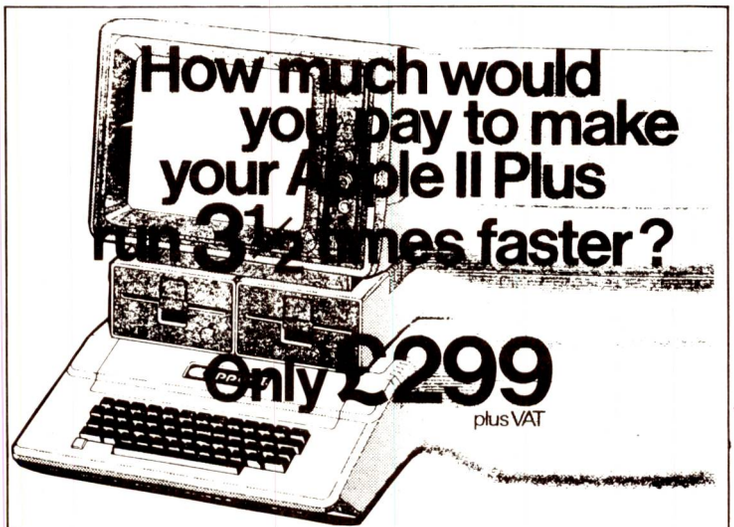

SAVES TIME

Imagine the time, energy, and frustration you could save by boosting your Apple's speed from 1 Mhz to 3.58 Mhz. That's 3½ times faster than normal, making the Apple II Plus arguably the fastest Micro on the market.

How is it possible? It's all down to ACCELERATOR II. This new plug-in board from Pete & Pam Computers contains a 6502C Processor and 64K of memory. The board runs all native Apple II software, including programs written in Applesoft, Integer, Machine Code, Pascal, Apple Fortran 77 and Forth.

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SUPER FAST

In November 1982, PCW published a bumper round up of all the Benchmark Timings since PCW began. The Olivetti M20 came out top of the 'league' with an average Benchmark timing of 11.5. Running the same Benchmark test programs, the Apple II Plus with Accelerator II averages a timing of 8.58 – that's an incredible 25% faster than the Olivetti M20.

We have reproduced some of PCW's findings, incorporating Benchmark Timings for the Apple II Plus with Accelerator II.

Machine	BM1	BM2	BM3	BM4	BM5	BM6	BM7	BM8	Average
Apple II Plus with Accelerator II	0.3	2.4	4.5	5.0	5.5	8.2	12.9	2.98	8.6
Olivetti M20	1.3	4.0	8.1	8.5	9.6	17.4	26.7	1.6	11.5
IBM Personal Computer	1.5	5.2	12.1	12.6	13.6	23.5	37.4	3.5	17.6
Osborne 01	1.4	4.4	11.7	11.6	12.3	21.9	34.9	6.1	19.9
Intertec Superbrain	1.6	5.2	14.0	13.9	14.8	26.3	43.2	5.6	21.9
Apple III	1.7	7.2	13.5	14.5	16.0	27.0	42.5	7.5	24.7
ACT Sirius 1	2.0	7.4	17.0	17.5	19.8	35.4	55.9	4.3	24.8
Xerox 820	1.7	5.5	15.5	15.1	16.2	28.9	46.1	8.0	26.1
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Commodore CBM 8032	1.7	10.0	18.4	20.3	21.9	32.4	51.0	11.9	34.3

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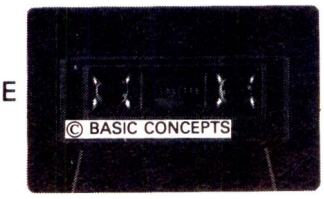

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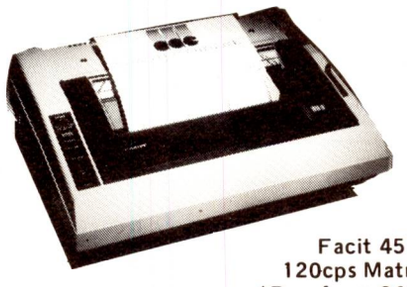

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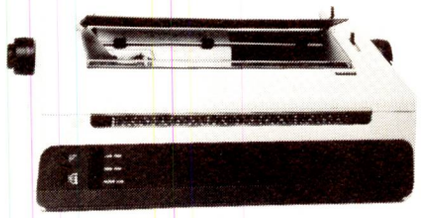

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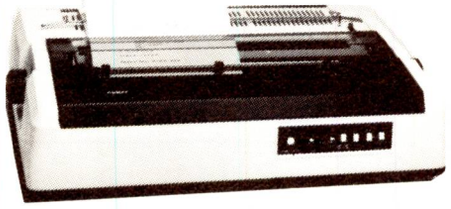

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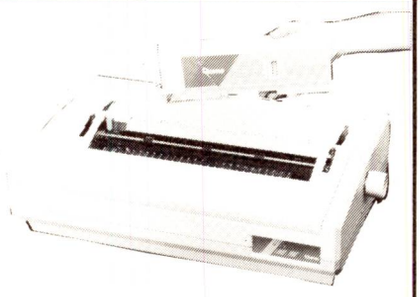

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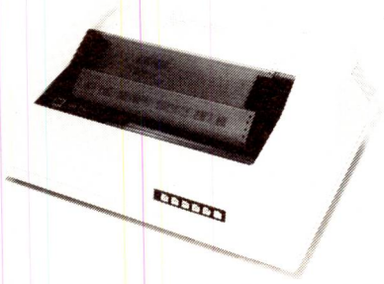

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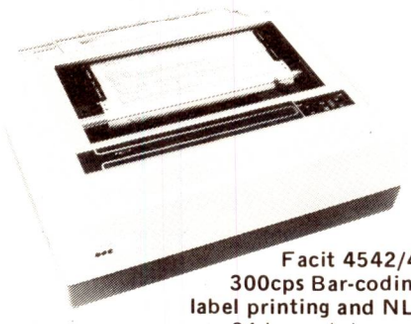

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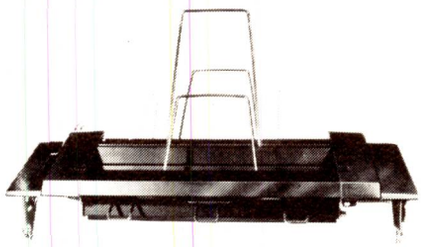

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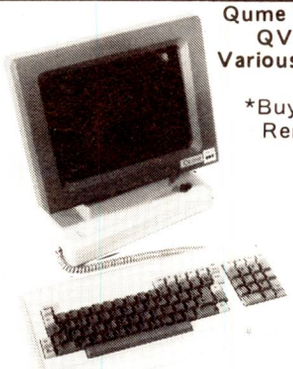



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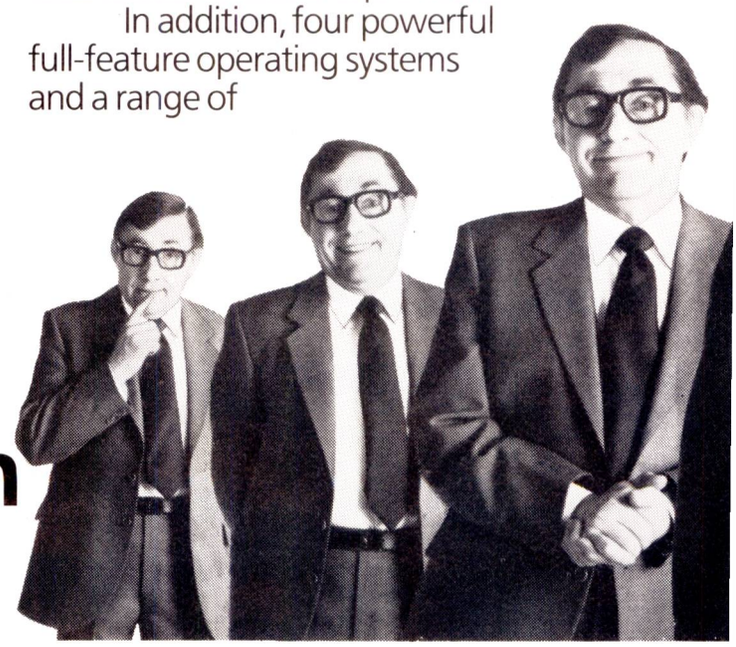

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Apple pipped?

Apples are the most popular micros in the world for business use, and the question on everybody's lips is: can Apple continue to sell well, now that IBM micros are available.

Two sides of this question need to be considered: first, how well is IBM selling, and second, how well are the new Apple IIe and Lisa machines standing up to the challenge?

In this country, the news is surprisingly good from the Apple IIe's point of view. Internal statistics from Apple UK show that since the IIe was launched, 6000 systems have been sold (up to end March).

March, of course, is a strange month in the computer business, since it is the time when all the local authorities find that they have a couple of thousand pounds left in this or that budget, and it must be spent before the financial year ends (or else they won't be allowed to spend it next year. This daft system is designed to encourage them to save money?).

So the sale of 3000 systems in March isn't quite as surprising as it sounds, even though Apple normally sells around the 1200 machines per month mark.

The question of how many Lisa (Let's Invent Some Acronym) machines will be sold is an academic joke until about this time next year. Rumour says that Apple can build 8000 systems worldwide this year, and has already sold all these.

My own information on the readiness of Lisa for the market indicates very clearly that it isn't going to be bug-free this year. It may be bug-free enough for the really enthusiastic user to tolerate by September.

On the other hand, the IBM sales are just going crazy. Stores in which Apples were previously the biggest selling line are now selling twice to four times as many IBMs as they ever sold Apples.

And while Apple will warn you, quite correctly, that there is always a big surge at the beginning of a computer's life (as lots of people buy a few to try out), you need not kid yourself into believing that this surge is going to fade in the case of IBM's micro.

Apple is not feeling the pinch here, but that is for two reasons: first, it makes its UK machines in Ireland, and second, IBM is not sold nearly as aggressively here as it is in America.

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

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

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

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

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

This is no longer true.

Despite having totally thrown away its advantage, DEC remains arrogant and secretive about the machine, proprietorial about its software (you can buy Rainbow software only from DEC and use it only with DEC-supplied blank disks) and unsupportive to the micro trade, with whom it openly plans to compete by selling direct to corporate buyers.

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

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

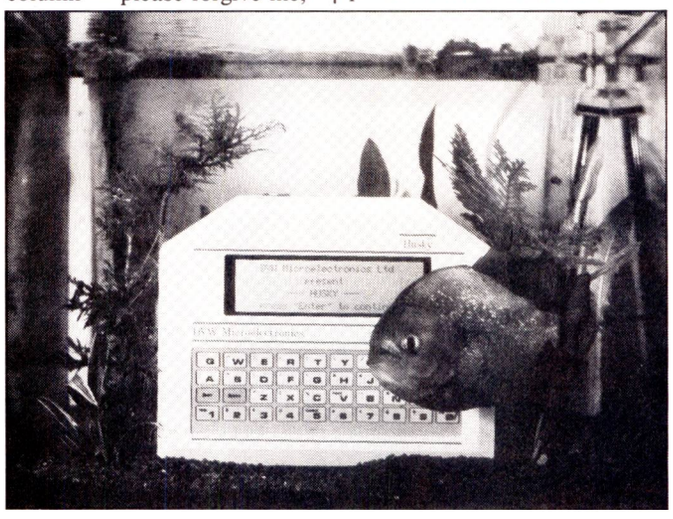
Lipsmackin'. . .

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

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

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

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



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

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

It is made by DVW Microelectronics, on 0203 668181.

soft-drink business was 10 years ago — it's a high-growth business, and competitors are still being formed.'

He added, with a lack of enthusiasm that takes the breath away: 'Once I left the security of Pepsico and went to the other side of the country to an industry I didn't know, I knew if I wasn't successful I'd have a tough time coming back.'

This is by way of explaining why Apple has promised to pay:

1) A million dollars sign-on fee.
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3) A million dollars if they ask him to leave.
4) Financial help in buying a two million dollar house in Woodside, in Silicon Valley.
5) 350,000 shares of Apple stock.

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

An open letter to Chris Curry, boss of Acorn

Dear Chris,
What on earth is going on?

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

They are nice machines.

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

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

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

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

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

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

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

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

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

I know *something* is happening, because when I rang to try finding out why, I was told that, under a new policy, I can only ask questions through your press agents. Quite what help this is to me or my various frustrated friends, I can't think.

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

Guy Kewney

Sharper Sord

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

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

Sord boss Takayoshi Shiina was tantalisingly vague about it all. He would not say which chips would be inside the system, and he wouldn't quote prices.

But he did say that the first 32-bit machine would be out 'soon' and hinted at June, and said that its performance would be 'about half the power of a VAX 11-780' — a very powerful 32-bit mini from Digital Equipment.

And the price, he said, would be about a tenth. That would put it at around £5500.

Since the Plexus micros/minis cost around £12,000 and get about 60 per cent of a VAX performance, this threat had better be ignored by most micro makers who want to live in peace.

In Britain, Acorn is promising its 32-bit system in summer. In America, Inner Vision showed a system using the Zilog eight-bit Z80 plus the National Semiconductor 16032 (a 32-bit chip) — and it was built on an S100 card, available now. So the Sord prediction is roughly in line with what we know to be going on in the world.

Sord also announced a local area network, of course.

Business brain

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

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

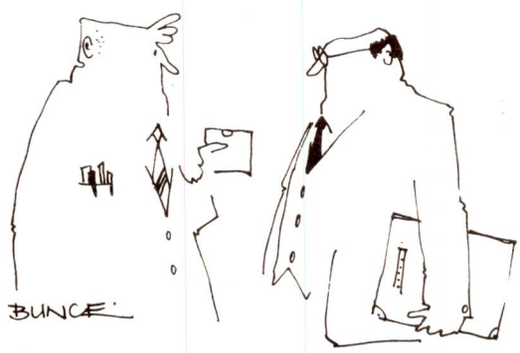
Not too many of the new CP/M systems will appear in the shops before August, because although the company is now making 6000 machines a month (and a fair proportion of those with disks) there are some prior orders to fill with initial factory output.

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

The company has also signed a deal with Software Sciences, (a Thorn EMI subsidiary) to handle maintenance. And there are plans to produce a desk-top 'system' in a box — from which you can still unplug your Newbrain, and take it home to play games.

A middle year

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



That's the trouble with BBC stuff — five minutes of original program and all the rest is repeats.

annual Hanover Fair will have to sleep in the gutter. No matter how many people turn up at the airport on the day, somehow they always find a front bedroom somewhere in the city, or near it, or within twenty miles of it, or even on the East German border, where you can spend the night.

But you certainly can't get a hotel room without booking a couple of years in advance.

That probably explains, more than anything else, why people who really want to know what the future will bring fail to go to Hanover each year.

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

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

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

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

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

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

Big talk on the Apple

Smalltalk is the language on which the Apple Lisa is built – so if you think you've never heard of Smalltalk but have heard of Lisa, then you don't need further explanations.

Lisa, as we all know, is the unattainable perfection which Apple just can't quite let us all have this year. So the arrival of Smalltalk on the Apple II is (apparently) a wonderful event.

It was demonstrated at Hanover on the Apple look-alike Basis 108 machine, and announced by C J Macie (an American in Germany) as being available for the Apple II and IIe, the Basis 108, the IBM PC, and the Sirius/Victor 9000.

Now for the pinch of salt: you need a minimum of 256k of memory, and the maximum (which I warmly suggest you don't try to manage without) is a megabyte (not disk, note: internal memory).

Not many Apple IIs that I have met have an easy way of attaching that much memory. Most get very stuffy about carrying 64k.

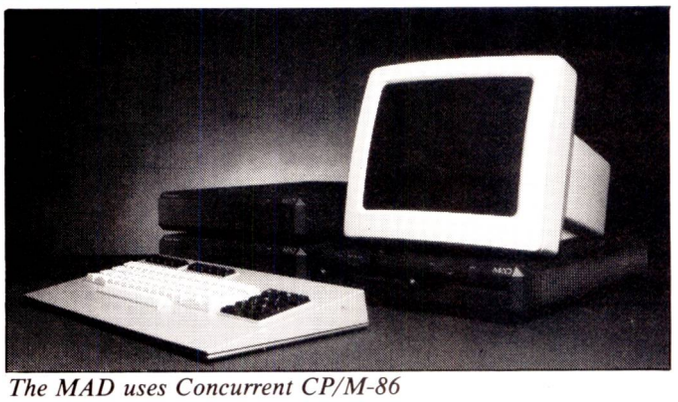
You also need a mouse (of course) plus a winchester hard disk for bulk data storage, plus a diskette to get new stuff in and out.

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

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

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

Basis machines are both Apple and CP/M compatible. The company is at 4400 Munster, Postfach 1603, tel (0251) 77169 or 617045.



The MAD uses Concurrent CP/M-86

Mad optimism

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

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

The most significant thing about the machine is that it uses Concurrent CP/M-86 for the main operating system, besides the IBM-like MS-DOS. The concurrent idea has yet to be tested in general use, but is wonderful enough in theory: you can run as many programs as you have space for, all 'at the same time' without having to stop each one, close files and log off before moving to the next. In other words, while working on Supercalc, you can check somebody's phone number under Cardbox, and register another widget sale under TABS (or whatever).

Nafeh is curiously wordy and uninformative about the rest of the system. His promotional document talks airily about how he has 'designed the processor to run with totally new proprietary software which is now being developed for us, based on developments in Artificial Intelligence', which means that the software is not available and does not work. He says that this 'revolutionary software will transform the entire understanding of small computers and their programs', which means that nobody yet knows how to use it. And he adds that 'we're talking about major changes that are as near as 18 months away', which means that none of the people working on the software have yet been able to give a realistic estimate of when they're likely to finish.

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

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

It is based on the fact that the 'advanced 16-bit processor' referred to in the glossy literature is apparently going to be the Intel 80186, which is indeed a very advanced chip, and an expanded and glorified version of the 8086, which is the 'big brother' of IBM's (and Sirius') 8088.

It is a lovely chip, compared with the 8088, but nothing I have heard about it included the fact that people would be able to buy thousands before the end of the year. And as for having fully debugged software to run on a system using it –

Prices slashed

Rumours of price cuts at the lower end of the home computer market have now become a reality.

W H Smith recently announced a large drop in the retail price of both versions of the Sinclair Spectrum and the ZX81. The 16k Spectrum is cut from £125 to £99.95 and, as the 16k Oric is yet to appear, the Spectrum now becomes the first sub-£100 colour computer. The 48k Spectrum is down in price from £175 to £129.95.

In addition, the price of the ZX81 has been cut from just under £50 to £39.95. It is thought that other major retail outlets will follow suit, and Sinclair itself was expected to announce price cuts on 2 May, after this issue went to press.

Also announced was a drop in price of the Colour Genie. Previously this had sold at £224.28 – this will now retail at £199 (including VAT).

Steve Mann

well, I'll believe that when I see it.

You can ask for details from 3350 Scott Blvd, Building 13, Santa Clara, CA 95051, tel (408) 980 0840.

Pocket Apple

Looking just like any other pocket calculator of the Sharp portable computer variety was a pocket Apple called the PA-2 Kiwi.

It was shown by the very well-known user group's, Assmann System, subsidiary complete with a parallel disk interface – and a disk.

It can also be connected to a real Apple at any stage for transfer of information.

The price for the machine itself, with a piffling 8k of memory (expandable to 32 max) is an equally modest DM800. The single disk, including interfacing, costs more than that at DM1000 – but it was a very nice slimline drive.

The display is not one that you will ever use for graphics, because it shows a single line of 16 characters on an LCD screen.

But since the machine includes its own clock (program readable) and an interface either to monochrome or colour tv, the queue for samples alone could be a long one.

Assmann supplies not Applesoft, but Kiwisoft Basic (very similar to my hasty appraisal) plus Pascal, Pilot and Lisp languages.

They can be contacted at the following address: Assmann Informatik 2000 Gmbh, Industriestr 5, D-6380 Bad Hamburg 1, tel (06172) 106-1, telex 0415158.

Something to declare

On the subject of portable computers, my own frequent travels through American customs with an Osborne have taught me the following useful lesson: 'when they ask you to open it up, they don't want to see the inside. They want to see the *Made in USA* plaque next to the on-off switch.

No, I don't know anybody making such stick-on labels for other systems. Sorry.

Link or lock-out

American firm Quadram showed a colour display controller for the IBM micro. It differs from most in allowing 16 simultaneous colours, and there are versions which considerably expand the detail at which the machine can manipulate pixels.

Rumours of an Apple-link card which will let IBM users run Apple software are exciting, but the company wouldn't confirm it, and there are obvious legal hurdles to clear. Apple tends to take imitators to court, and even if it doesn't always win, it is stupid to count on this in advance.

Quadram is on (404) 923 6666.

IBM black box

A Japanese firm which is pinning its faith on the same humorous iAPX186 Intel chip is Kyocera, a firm which was strangely offended by my admission that I'd never heard of them.

One would think this was natural, since they say that they sell to other people, who put their own badges on the boxes of the Kyocera imitation IBM machines.

The company makes everything from ceramics to chips to circuit boards, and decided the logical thing was to turn these bits and pieces into a computer.

So it showed a super-IBM black box. Its keyboard has a mouse-hole (mice are things for controlling the cursor position on a screen) and the processor has a set of slots which let you plug other, rather cheaper, processors into the back and run them as parts of a network.

Price, they said, was their business. But they assured me that there would be no point in starting the venture if they couldn't do it for a lot less than IBM, even after their customers had put their own badges on and taken their own profit margin.

The company also makes artificial hips, knees, and teeth. Don't write to Japan: they have offices in America and Germany. The German phone number is (07153) 611, and the American phone number is (619) 279 8310.

Corona's arrival at Hanover was more auspicious, since that company is actually shipping IBM compatible equipment. And while I was watching, people from Peachtree came up with diskettes of IBM software, and shoved them into the Corona disk slots, and they ran.

Compaq, the best-publicised of the look-alikes, is very acid about Corona's claims to be compatible, because Corona has improved on IBM's graphics.

The claim that Corona people make is that they are MS-DOS compatible, which means that when they send a list of instructions to MS-DOS, that program will make their system do exactly what the

Birthday party

Sometimes it's hard to believe it, but *PCW* is five years old this year. As Europe's first microcomputing magazine, we got off the ground in February 1978 as a bi-monthly magazine catering for what was then a very obscure hobby indeed. Now we outsell all the other upstart mags by a long margin and there's no sign of the market's expansion rate slowing down.

To celebrate our fifth birthday, we decided we ought to hold some sort of a booze-up. The Reptile House at London Zoo was the unanimous favourite as a venue until we realised that quite a few of us probably wouldn't be let out again. So we held it in the cosmic gloom of the London Planetarium instead with Isaac Newton and Albert Einstein (or, rather, effigies of them) staring disconsolately at all sorts of micro industry persons making idiots of themselves.

And we took advantage of the occasion to present a cheque for £5000 to the winner of the great *PCW* Manhunt Competition, Mr Stan Higgins, who surprised us all by ringing up with the correct answer when the ink was hardly dry on his copy of *PCW*!

Peter Rodwell

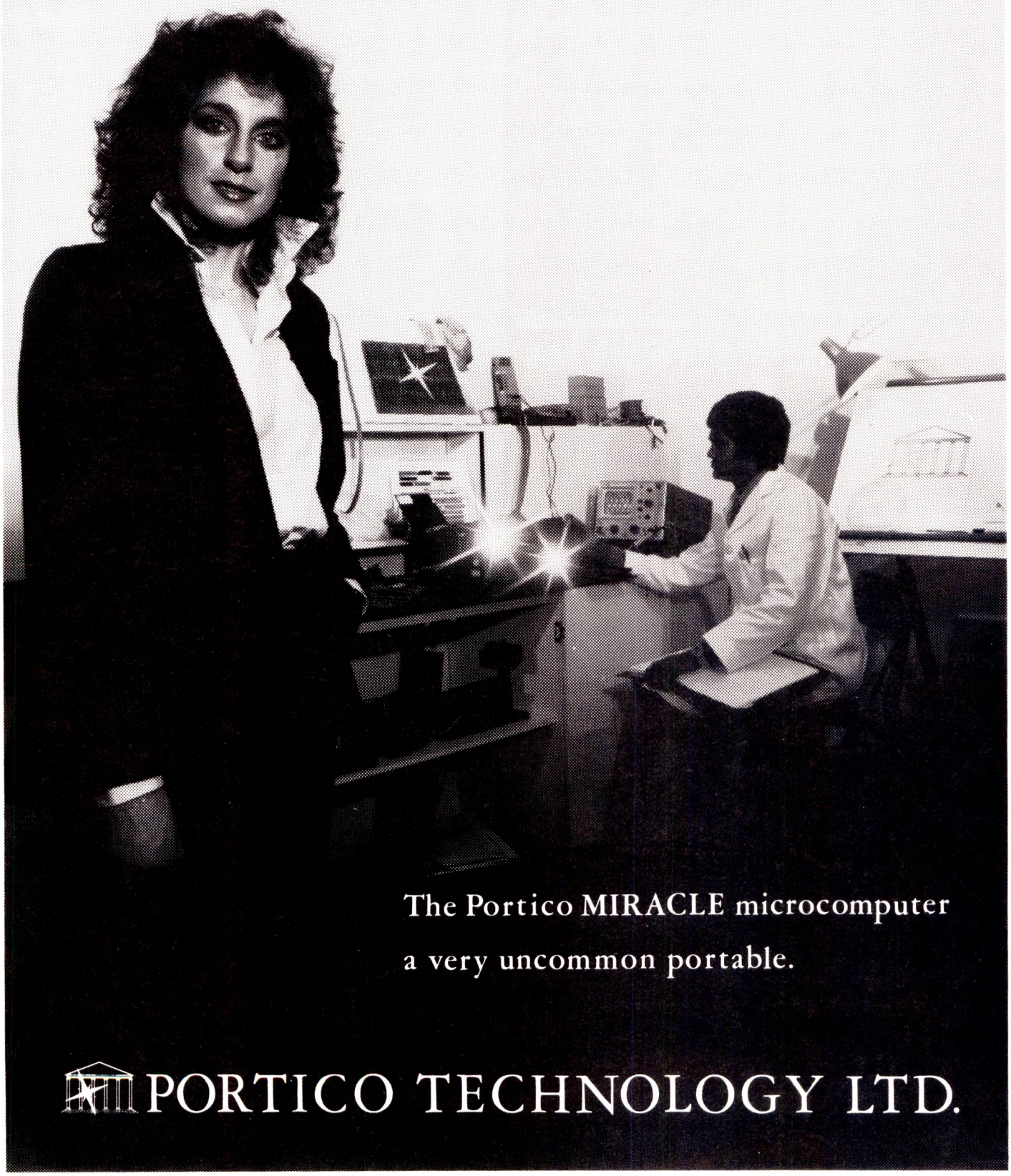


The PCW 'Gang of Four' – its Editors, past and present. Left to right they are Meyer Solomon – our first Editor – David Tebbutt, Jane Bird – our new Editor – and Peter Rodwell.



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

"We're creating Miracles"



The Portico MIRACLE microcomputer
a very uncommon portable.

PORTICO TECHNOLOGY LTD.

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

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

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

In desk-top computer systems, such thinking is silly. In portable systems, it is plain potty. 'Here is your computer, and it fits under an airline seat. Just don't take it too far.' Exactly what we've all been looking for.

Computer phone

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

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

Not so sharpish

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

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

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

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

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

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

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

Joking aside

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

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

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

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

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

So: put your money where your mouth is, Jack and tell us where the software is.

'We're showing the software to our major customers,' said Jack loftily, 'not the press.' Heavens, I wonder why.



The typewriter in this picture is a computer. It is the Olympia ESW 103 KSR, and KSR stands for Keyboard Send Receive —which means it can be used as a terminal to a remote computer.

To demonstrate it, Olympia linked the machine to British Telecom's Dialcom service, now called British Telecom Gold. It worked. At £1,098 plus the cost of the acoustic modem, it ought too.

Olympia is on 01-262 6788.

Pricey portable

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

Ask a silly question...

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

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

Then he turned his innocent high-wattage IQ eyes on me

and asked with palpable puzzlement: 'Tell me, why is it that all English journalists here ask about the Bildschirmtext contract?'

I can't think. Perhaps to take their minds off the Christmas $2000 Lisa (Ha ha, oh, ho'ho ho! Ooh, hee hee hee!) from Commodore.

What's in a name?

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

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

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

Executive perks

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

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

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

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

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

Acorn antic

We recently received a BBC micro in the *PCW* office, on order from Acorn. When it arrived, it was minus a cassette lead. Well, perhaps you have to order it separately, I thought. But no, no sign of a cassette-connecting lead on the order list. So I rang Acorn. 'Does the lead have to be ordered separately?' I asked. 'No,' I was told. 'We've discontinued them.'
Surya

Transition to IBM XT

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

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

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

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

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

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

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

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

Inner conflict

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

Acorn's claim to immortality always rested on the BBC Micro's ability to withstand the future – to be upgraded, year by year, into the latest design.

This year, of course, the latest designs are starting to show the most powerful processor chips, and these have enormous 32-bit data words. That means, where you and I use eight-bit bytes to store things in, and can have up to 255 different characters to choose from in each byte, they have 32-bit words, and can store 2 to the power 32, less one, different characters.

Inner Vision got into this market in a very similar way to Acorn's proposed 32-bit add-on for the BBC micro. But instead of designing their own complete system as the foundation of the big one, they just produced a board which any S100 system user can plug in.

The board has a Zilog Z80 with CP/M on it, and next to the nice, familiar chip is the enormous National Semiconductor 16032.

Software? Not much, but quite a bit of help for those who want to write their own. The Z80 can be used to write programs for the 16032, and files are stored (for the time being, at least) using CP/M.

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

Wizardry

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

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

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

the target video games machine.

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

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

Obedient Waldo

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

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

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

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

Pinball construction

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

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

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

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

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

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

Chess Tournament

The 4th European Microcomputer Chess Tournament will be held from 28 September to 2 October this year. Entries are invited from amateur chess programmers and from manufacturers of dedicated chess machines or cassette-based programs.

The tournament will be an integral part of the *PCW* Show at the Barbican Centre. Further information from Tony Harrington, *PCW* Magazine.

A prayer answered

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

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

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

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

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

Visionary 100 is a little (fairly cheap, around $300) box which does all the communications work and, with a little more evolution, will actually let you use your own computer when you are somewhere else. Details are available on (415) 751 8811.



Many companies use a language called APL (A Programming Language — no kidding) as a management tool — allowing staff (usually accountants) to write their own programs for the big company mainframe.

Eddie Bleasdale, the man leaning on the disk unit of the Bleasdale BDC600 computer, reckons that by supplying these people with his Unix-based supermicro, he will give direct control of computing to departments who use a lot of company mainframe time, or a lot of remote time-sharing services.

The price of this super-micro — well over £10,000 minimum — does mean that few other people will be in the market to buy one, however.

The version of APL that he runs is the Dyalog APL, which is Unix-based.

Details from Dyadic Systems, the suppliers of the language, on (0252) 547222, or from Bleasdale on 01-828 6661.

No free chips

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

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

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

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

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

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

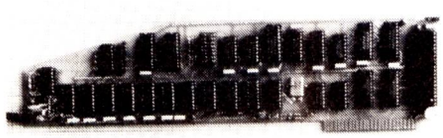
Parting company

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

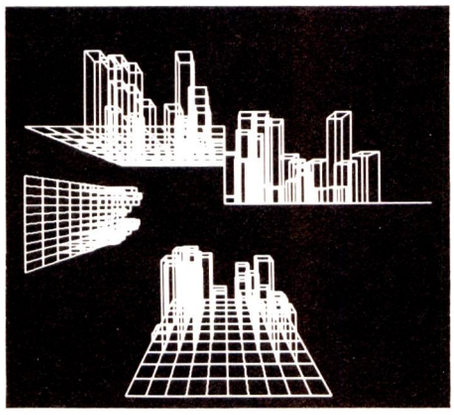
They also revealed that the deal with UK importer Comart was 'over by mutual agreement' and that they were

512 x 512 GRAPHICS

Digisolve offer you a way to increase your graphics speed and resolution. Using a high speed graphics processor, our cards draw lines and characters FAST. The graphics processor works in parallel to the host machine, and gives you the power of using a co processor specifically designed for graphics. With drawing rates of up to 1,500,000 pixels per second, lines appear instantly to speed up your plotting.
With the resolution, we offer new possibilities for software and systems. No longer is it necessary to consider one of the new 16 bit personal computers because of their better graphics. Digisolve offer a card designed for the Apple II to give 512 × 512 monochrome graphics. With the development of an 80 × 57 line Visicalc and Applewriter pre-boot, serious business users are no longer finding 80 column cards good enough. We also offer a colour unit designed to connect to any computer to give the same resolution but with 64 colours.
Digisolve are committed to the development of graphic systems and character display equipment and have a rapidly growing software base to help you use better graphics.



APPLE II CARD



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

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

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

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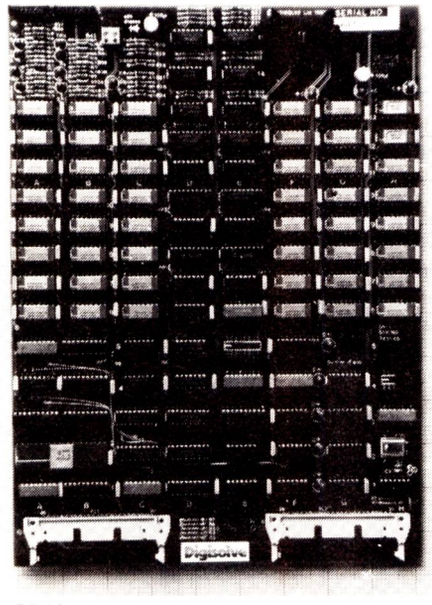

VGP64

VGP 64

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

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

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APPLE II is the Trade Mark of Apple Computers Inc.

negotiating with potential new distributors.

And, like everybody else, they launched a local area net called NorthNet. To the slight embarrassment of fellow TRW subsidiary Datapoint, the NorthNet system doesn't use 'token passing' but 'contention management' — and if you don't understand that, don't panic. All these networks are hopelessly premature anyway.

Olivetti add-on

Olivetti isn't sure that it's all that important, but the M20, just as an aside, now runs standard operating software.

That is: it runs CP/M-86 and MS-DOS on an add-on processor.

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

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

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

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

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

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

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

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

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

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

END

CTUK! NEWS

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.

The Gremlins have been out in force on *PCW* over the past couple of months. The place where their assault has been most noticeable is this page, CTUK! News. Perhaps they don't like the idea of mixing it with Newsprint and this is their way of showing it... Never mind. We're sorry you didn't get to hear about the nation's computer literacy project for a couple of months and promise to do our best to keep things running smoothly in future.

The great thing about having missed a couple of months is that we're now in the happy position of having plenty to report on, some of it recent, other parts – due to our little disasters – not so recent.

New Computer Towns:

Lowestoft:

Contact: J G Batch, Central Library, Clapham Road, Lowestoft. Tel: 0502 514162.

This 'Town actually began in October 1982 and we've only just heard about it. It meets every Monday evening from 7-9.30pm in Lowestoft Library. It's run by library employees with the support of Suffolk County Library.

They have lots of games running on all sorts of micros and are writing some of their own 'serious' software. The 'Town also acts as a contact point for those wishing to buy hardware.

Watford:

Contact: John Byfield, Moonrakers, The Rutts, Bushey Heath, Herts WD2 1LH. Tel: 01-950 1041 (home).

CT Watford began in January 1983 in the Central Library, Watford. Meetings are held between 7-8.30pm every other Friday. This 'Town desperately needs volunteers with knowledge and/or equipment who are willing to help out.

Rayners Lane:

CTUK! Club.

Contact: Derek Knight or Bob Carter. Tel: 01-866 9185.

Meets alternate Saturday afternoons from 2.30-4.30pm. Began in early February. Volunteers needed!

Other News:

Join CTUSA! and get a newsletter telling you all about their activities and ideas. Subscriptions: $15pa – under 16s; $25pa – adults. PO Box E, Menlo Park, CA 94025, USA. A visit to their offices during a trip to the West Coast Faire revealed a great deal of interesting ideas on teaching the public about computing. CTUSA! publishes a range of leaflets and booklets to advise people who are running 'Towns and, although these are geared to the American population and its attitudes, they are full of interesting information. CTUSA! is far bigger than CTUK!, comprising an office devoted to the project and over 200 'Towns nationwide (and some in Europe).

Newcastle-upon-Tyne Polytechnic's Handicapped Persons' Research Unit is looking for information on the use of micros to help the disabled. Information gathered will be used towards a microfair to be held in Newcastle in summer 1983. If anyone can help in any way, perhaps they'd contact Peter Curran, Exhibition Assistant, 1 Coach Lane Campus, Coach Lane, Newcastle-upon-Tyne NE7 7XA.

As for more recent news, we seem to have a spreading of CTUK! worldwide. One Computer Town has started in South Africa and a library in Johannesburg wrote in for guidelines. Computer Town SA, under the guidance of Nigel Sullivan-Tailyour, held its first meeting on January 20th.

And still in the great continent of Africa, one Colonel Williams wrote to us requesting information about the project. Anyone who may have ideas and/or information they might like to pass on to him should write to: Colonel O I Williams, Headquarters, Training and Doctrine Command, Nigerian Army, Military Cantonment, PMB81, Minna, Nigeria.

Things on the home front have, though, been rather quiet as far as contact with us is concerned – is it because we're in disgrace?

Lastly, just in case you hadn't noticed, all correspondence should go to 62 Oxford Street. Maggie and David have both moved house.

Bigger and better

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

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

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

More on Europe's biggest Microcomputing Show next month – watch this space!



BANKS' STATEMENT

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

MICRO MACHISMO

Regular readers will be aware by now that I have a considerable suspicion of all video and computer games. I am also aware that such suspicion puts me into the minority.

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

Right, the story.

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

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

Being as naturally inquisitive as the next man, he decided to investigate, and soon discovered the ROM cartridge plugged into it carried some mention of a game not totally dissimilar to Space Invaders. 'Cor, lesshavago,' quoth he, and reluctantly I plugged in the joy sticks.

He then proceeded to tell me all about his days at college where he had been, at one time at least, the *de facto* Space Invaders champion of the students' union bar. At the same time he was waggling the joystick and decimating the display, flying saucers and all.

Soon enough he had cleared the first screenful while still on his second rocket launcher or whatever the damned things are called: there was one more to go. His score continued to mount until it was several orders of magnitude greater than anything I had ever achieved in the half dozen times I'd played the game.

Suddenly, disaster struck. From nowhere, a treacherous Invader dropped a couple of sneaky bombs and the war was over. Not only did the televised Fatherland lay pillaged and in waste, but one ego sat before the screen vaguely crumpled and defeated. 'I used to be able to clear two screens every time,' the ego's owner confessed.

Suddenly, disaster struck. From nowhere, a treacherous Invader dropped a couple of sneaky bombs and the war was over...

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

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

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

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

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

So much has been written in the past by pundits, experts, genuine thinkers and the like about what the computer/micro-electronic/information technology revolution can offer dear old humanity (even I have made the odd mention of it in the past). Much has been made of how the bad aspects should be watched and controlled, or how the use of machines by unscrupulous individuals and governments could come to dominate the actions, even the thoughts of people. Much has also been made of how the computers can be used to advance knowledge, education and creativity to the point where a kind of Utopia could be made a practical reality.

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

Even I accept that, in reality, this is a fond dream. I do not accept, however, that the hopes and aspirations that lie behind the dream should not be pursued; that all the goals are unattainable. That some are attainable can be seen now in music, where the 'computer' in the form of the synthesiser *et al* has opened up the possibility for individuals to display and develop their creativity without recourse to ten years or more of hard labour learning an instrument.

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

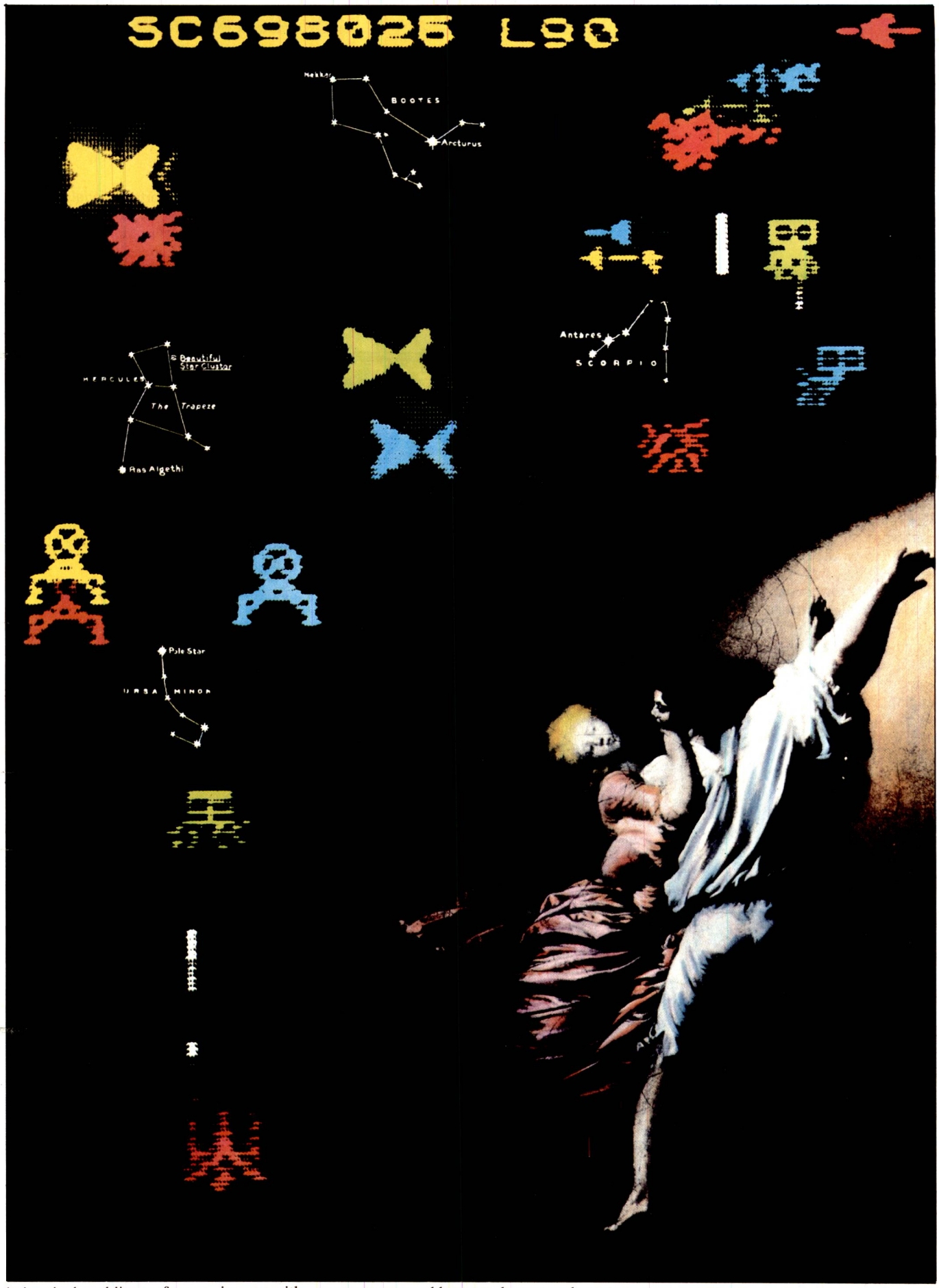
As a musician myself (and a poor one) I personally feel that coming to terms with an instrument is the best way, but I am not so much of a purist as to condemn those whose urge to create *now* demands that they take whatever route is available to circumvent the drudgery. That, to me, is an excellent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

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

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

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

The demonstration of a machismo in



being the best blitzer of screen images with other screen images is probably better than exercising it by beating up one's fellow human beings in the flesh.

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

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

END



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.

Improvements for Atari

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

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

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

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

Alternative keyboards for Atari

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

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

Microshell for Z80

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

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

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

The TYP command in Microshell is similar to CP/M's TYPE, except that the display pauses every 23 lines until a key is pressed.

Perhaps the stongest feature is the Unix style Shell, which allows commands to be read from a file in a more powerful and faster manner than SUBMIT and XSUB.

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

Commodore 64 clarification

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

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

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

The only UK user club is ICPUG, which as well as providing a national newsletter, software library and discounts, also supports regional group meetings throughout the UK. Contact the Membership Sec at 30 Brancaster Rd, Newbury Park, Ilford for details. There are no magazines dedicated solely to the 64 at present.

Commodore are producing a *Programmer's Reference Guide to the 64* which tells you all that the initial user guide doesn't! It is an excellent guide which indicates how to use all the 64 facilities, such as high res plotting, and altering the use of RAM space. There is also a book, *Commodore 64 Computing* by Ian Sinclair, published by Granada at £5.95.
Brian Grainger, Independent Commodore PET Users' Group

First choice...

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

The Electron is essentially a lower-cost entry to the BBC Micro, providing the computing and display facilities, but with the other built-in hardware features of the Beebon available for the Electron as bolt on goodies at extra cost. Look carefully at the BBC Micro specification. If you plan to add many of those features, it may be cheaper to start with the Beebon. You may also save yourself a long wait, since both the Electron and some proposed BBC add-ons seem rather slow coming to market. On your questions: Yes, and there are several modes to choose from, each with its own advantages. Yes, but this will be very slow unless only

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

More directory space

I have a problem with files on my TRS-80 Model 1 disk system, which has 2x40 track and 2x80 track drives running under NEWDOS 80 V2. I have a time sheet system which creates a file for each client on the 80 track drives. I have some 110 files on the disks, which now have zero FDES but about 108 grans left. Is it possible to reserve more directory space, as this would appear to be the problem?
T R Martin, FCA, Fulham
You are quite right; the trouble is due to having filled up the available directory space before running out of disk space. This is a common problem when using a lot of small files.

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

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

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

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

Printer parameters

I also have a problem using the new DMP400 printer, which I would like to force to produce 80 columns instead of the normal 132. This is for program listings, so I cannot alter the program output.
T R Martin, FCA, Fulham
Your printer problem is also a fairly common one, so I will give a general answer to help as many readers as possible. There are two approaches; both depending on the printer having the necessary features. Read your printer handbook to see if either is supported.

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

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

Young entrepreneur

I am 15 and write programs as a hobby, but I would like to sell them on cassette to earn a little money for add-ons. Where would I stand on VAT? How can I market my tapes, and can I use programs I have had published in magazines?
(Name and address withheld by request)
There are very many people already marketing programs they have written; you only have to look through the small ads in *PCW* to see. The competition is fierce and unless you have around £500 to invest in a larger ad to start such a venture you are unlikely to catch the eye of the mass of users. Don't let that put you off though. Test the ground first to assess demand. Start with a small ad in a magazine that specialises in your particular micro. Make sure that you can cope with a rush of, say, 100 orders in the first instance, and don't bank the money until you are ready to despatch. Keep clear and detailed accounts. You will not have to register for VAT, so no need to worry about that yet.

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

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

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

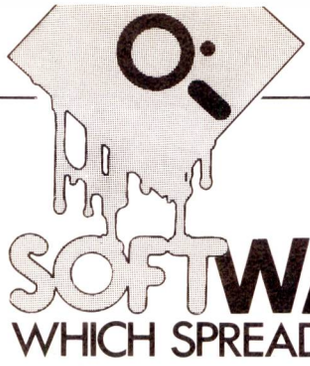
Please make sure that your programs have been tested and debugged thoroughly — use several very critical friends, offer to give them £1 for every error or sensible criticism they find. If you are not willing to do that, then I suggest that you are not confident enough in your program to market it. Remember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

Disk dilemma

Trouble with 'back-up' on my CBM 8032 has corrupted part of my primary disk. Some files shown in the directory give a 'file not found' error, preventing disk back-up. Could you give a routine to read the file names from the directory into an array, so that I can use it in a file copy program which skips the corrupted files on the primary disk.
A J Willis, Beaconsfield
People who are getting deeply involved with the PET/CBM micro should invest in *Programming the PET/CBM* by Raeto West, published by Level at £14.95 (or £15.90 post paid from MoI, St Albans 52801). Chapter six deals at length with disks, and on page 218 you will find a routine to read and print the disk directory, which I am sure you will be able to modify to store the directory contents instead.
Len Warner



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



WHICH SPREADSHEET?

EXPANDING THE APPLE

Visicalc on the Apple is usually limited by the 40-column display and 25k of free RAM. Mike Liardet investigates Vergecourt's answer to the problem.

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

Since those early days, the two MIT graduates, Dan Bricklin and Bob Frankston, have grown into a company (Software Arts) of 50-plus employees, and Visicalc is now available on more than ten different machines, from PETs to IBM PCs. There are also a score of imitators — some have been covered already in this series — and a host of Visicalc add-ons and 'improvements' produced by independent manufacturers.

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

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

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

A roofrack for the Apple

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

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

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

Visicalc alone

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

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

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

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

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

Using Visicalc alone

The Apple version of Visicalc is a complete turnkey system. To get started, put the disk in the drive, switch on and you are fairly instantly treated to the world-famous display. Part of the screen is displayed in inverse characters (ie, white background): a status line at the top, followed by a

prompt line and then, skipping a blank line, we have the inverted 'L'-shape for the border of the spreadsheet itself. At switch-on the spread-sheet area is completely blank, except for the cursor at the top left-hand cell. On screen at any moment 20 lines four spreadsheet cells wide can be displayed. Of course, as the Apple screen is only 40 characters wide, that is all there is room for (until you upgrade with Vergecourt), but like most of its imitators, Visicalc permits cell widths to be changed. So if you are working with small numbers you can fit more cells in the width available, but you are still stuck with a maximum total of 40 characters across.

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

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

Of course, Visicalc has an extensive range of maths facilities including trig, logical, row-sum, not to mention 11-digit precision arithmetic. The only facility I am inclined to criticise is the printing. Every time you do a printout you have to remember a cryptic sequence of characters to initialise your printer and then find the bottom right-hand corner of the area you wish to print. Visicalc does not automatically break reports into sections if they should happen to exceed the maximum width allowed by your printer stationery (and most spreadsheet reports do exceed the maximum), so by careful column counting or hit-and-miss experimentation you have to organise the correct breaks yourself.

Finally, I ran Visicalc through the standard Benchmarks. Like most spreadsheet systems on 8-bit micros it is relatively easy to run out of memory, long before the actual theoretical spreadsheet area (254 x 63 with Visicalc) is filled up. This seems to be a fairly universal problem with 64k RAM 8-bit processor micros. The only way round it is to get rid of the whole lot and go for a 16-bit micro or, less traumatically, consider the delights of memory expansion facilities . . .

Enter Vergecourt!

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

Just to clarify what I found to be a fairly confusing plethora of product names, here are the Vergecourt offerings relating to this article:

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

Super Expander software. This simply enables Visicalc to use the 128k RAM card, increasing maximum spreadsheet size from 25k to 136k — ie, by more than five times. Since the huge spreadsheet models can take up to two or three minutes to save on disk, Vergecourt has thoughtfully provided additional commands to do quick loads and saves — around 20 seconds or so.

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

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

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

Getting started

Having fumbled for a few seconds attempting to open the elegant packaging for the 128k RAM card, I had to reach for my sunglasses when I succeeded. Vergecourt has departed from the usual boring green printed circuit board and adopted a stunning ketchup red. Coupled with the dazzling gold labels signalling the usage of new generation 64k-bit RAM chips, the overall effect is of a fairly striking piece of hardware. It's a pity that you can't see it when you are using it (and enough to tempt you to buy one of those transparent lids now available for demonstration Apples!).

The board is slightly larger than most Apple peripheral boards — about the same height but slightly longer than a punched-card, if you can remember back that far! It comes complete with 16 64k-bit RAM chips, providing a full complement of 128k of RAM, and six LED status lights (of little consequence to the Visicalc user but nice to watch flashing on and off, I suppose). Unlike some other Apple RAM boards there is no extra 'strap' attached to the board, and thus no need to remove a chip from the Apple main board to plug the strap in. This makes installation extremely simple — just a matter of switching off and plugging the card into a vacant slot. The most tricky part of the whole operation is fathoming out which slot can be used. After much manual scouring, I eventually determined that in my case anywhere would do — Vergecourt software can automatically find the location of the card, so in most instances it does not matter where you put it as long as it's in the Apple somewhere!

To get Visicalc running and using the new card involves a 'two-stage boot'. Switch on with Vergecourt's Expander 80 disk in place then, after a short delay, replace it with your normal Visicalc disk. Before this disk can be read you must indicate which type of 80-column display card you are using. I found this a little puzzling in two ways. First the question is asked on a neatly formatted display already using your 80-column card — if it can get this right before it asks the question, why ask at all? Secondly, you have to type in a number, but it does not tell you on the screen which number is for which card, so you have to consult the manual. Anyway, as soon as you hit the right number, the disk drive starts whirring and after a pause (just a little too long) with a totally blank screen, the familiar Visicalc screen appears. (Vergecourt has pre-empted this criticism with the 80.2 — a 'Please Wait' message is shown.)

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

Eating (RAM) chips

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

Manual trouble

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

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

EXPANDING THE APPLE

the manual! Another source of annoyance stemmed from the fact that two manuals are provided (one for Visicalc users and one for everyone else). Both are identical on the outside with no title at all! I, of course, kept picking up the wrong one. The internal presentation of each manual was mediocre (with a few pages stapled in place) but difficult to flick through, and with the give-away serrated edges at the bottom: presumably a daisywheel printout onto continuous stationery. Given the obvious effort that Vergecourt has made with its product presentation, glossy advertising literature, etc, I felt surprised that it had let these fairly short manuals 'slip through the net'.

Visicalc enhancements

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

Most pertinent to working with large spreadsheet models are problems with saving and loading to disk. It's all very well being able to create 136k spreadsheet models, but how do you get them onto slow and low-capacity Apple disks? Vergecourt has attempted to solve this one in two ways: a special fast 'binary-save' and the opportunity to save in two or more halves. Since saving in two halves involves using two disks, with the consequent risk of mis-pairing with other paired disks, Vergecourt suggests you save each half on both sides of one disk. This is risky, particularly with disks only rated as single-sided (ie, disks most commonly used with Apple).

Vergecourt has also, with its new 80.2 software, embedded a whole range of new facilities in Visicalc. These facilities are irrelevant to anyone solely concerned with memory expansion and 80-column displays, but should be of interest to anyone wanting to generate a Visicalc 'turnkey' or 'templated' application. It has provided variable column widths, protected fields, hidden fields, fast data entry, choice of numeric formats and a few other goodies besides. Vergecourt also claims that, with the 80-column screen and extra-large cells, Visicalc can be used as a word processor. My only comment on this is to quote Visicalc author Bob Frankston's remark on this very topic: using Visicalc as a word-processor is 'like the drunk who has lost his key . . .' (he looks under the street light even though he lost it up the street).

In conclusion

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

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

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

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

Checklist

Documentation: Disappointing. Two small manuals, one for Visicalc users and the other for applications programmers. Mitigated by the fact that there is little need to use them after the system has been installed.
User-friendliness: Very good. The enhancements are totally integrated into Visicalc, so a trained Visicalc user would need only about two minutes to familiarise himself.
Facilities: (Depending on which Vergecourt software you select) 136k or 255k maximum model size, interface to 80-column cards, fast disk load and save, partial load and save, extra formatting, protected fields, hidden fields, validation, variable column widths, fast data entry. All this in addition to the existing Visicalc features.

Benchmarks and other measurements

Both 136k Visicalc and 34k Visicalc were tested. Where different the 34k Visicalc figures are appended in parentheses. (For more information on these tests see *PCW* February 1983.)
Measurements: Up to 255 rows and 63 columns. Each column can be up to 77 (37) characters wide. Numeric precision is 11 digits.
Benchmark 1: (a) 320 (82) rows; (b) 176 (43) seconds, ie, approx 2 rows per second in both cases; (c) as for (b); (d) 1.35 (10) rows per second, 2.5 (6) columns per second.
Benchmark 2: No real limit (148) rows of text.
Benchmark 3: No real limit (254) rows of numbers.
Price: 128k RAM card for £295+VAT, expansion software from £40 to £80+VAT.
Further information: Vergecourt Ltd, 17 Nobel Square, Basildon, Essex. Tel (0268) 728484.



'Poor Arnold — what he needs is an expansion interface for his brain!'

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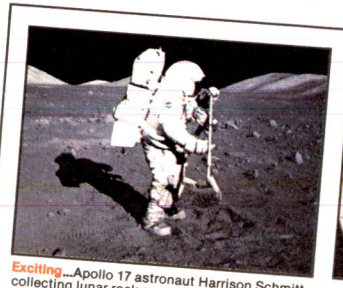

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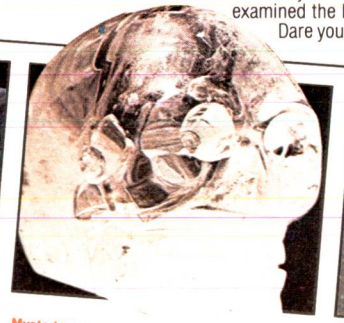

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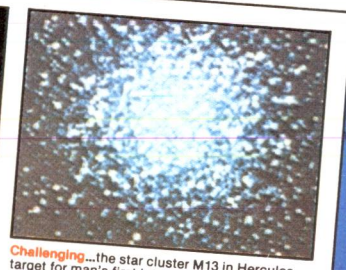

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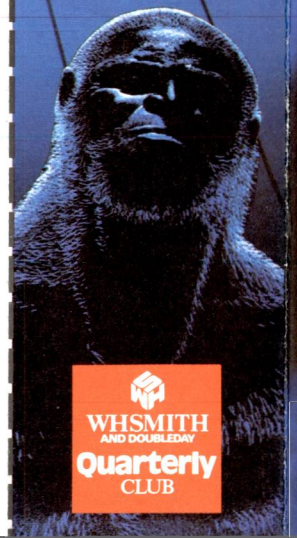

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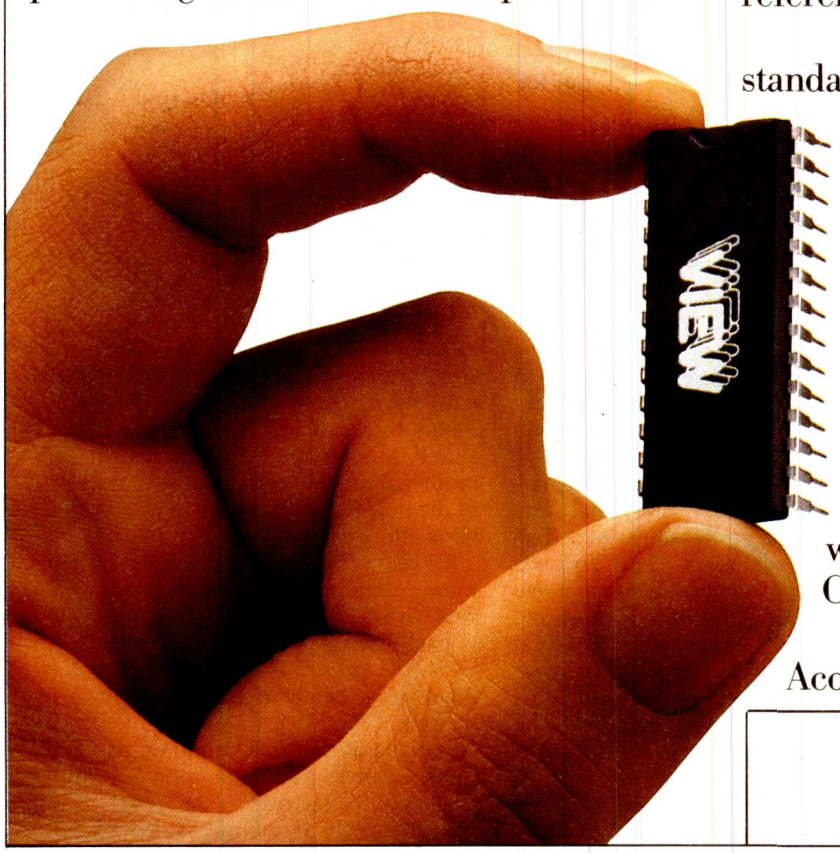

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BENCHTEST

COLOUR GENIE

Maggie Burton finds out whether this is the Genie we've all been wishing for.



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

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

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



12-key numeric joysticks

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

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

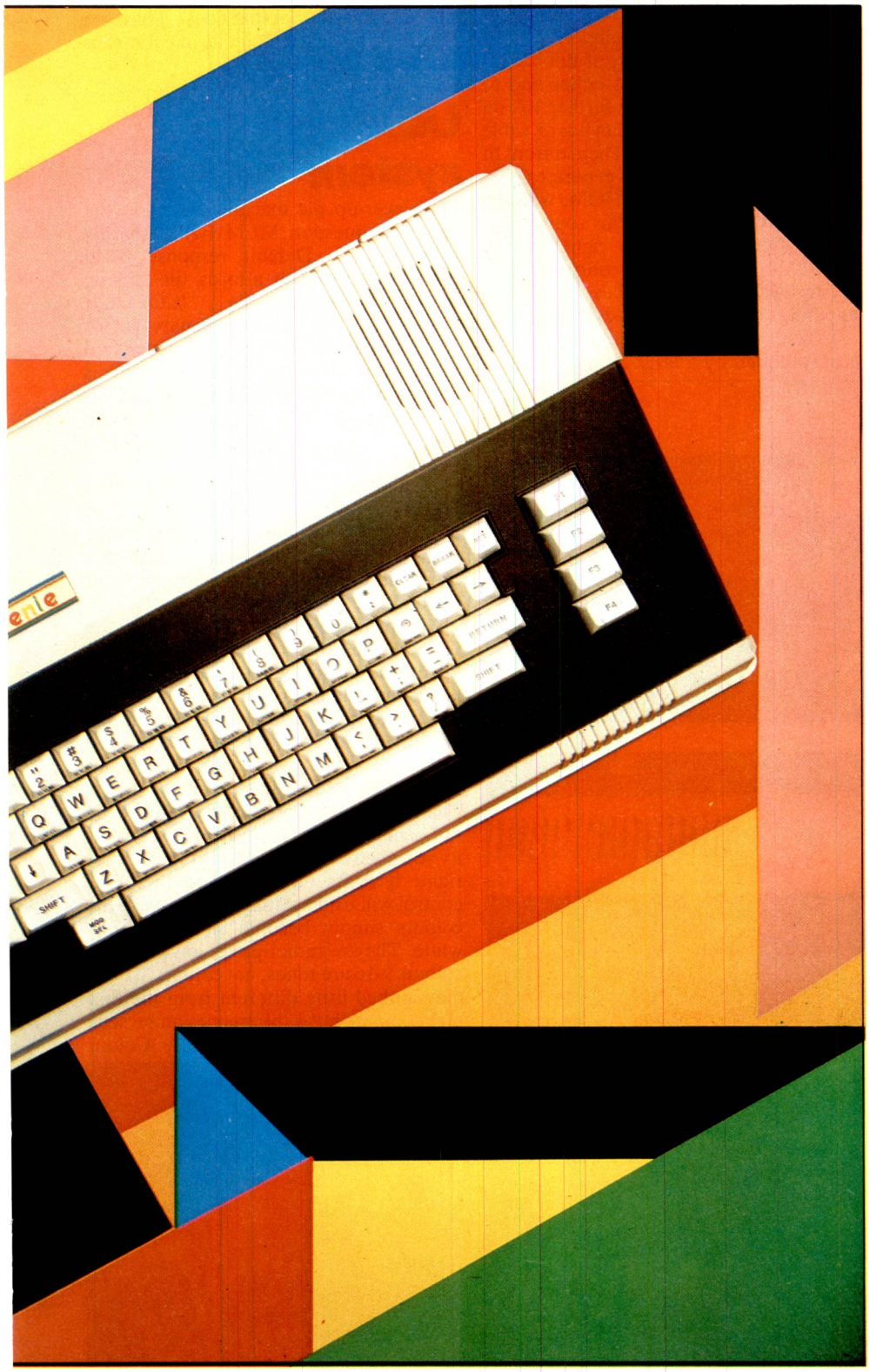
The initial impression of this beast is one of a machine which was built to withstand a lot of knocking around. Should robustness rate highly on your list of points to consider when buying a machine, the Genie will almost certainly rise in your estimation.

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

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

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

Looking at the back, from left to right are the cassette port, expansion bus (into which ROM cartridges can plug), TV lead, audio (hi fi) output, video (RGB



monitor) port, power switch (which is a rocker switch and made harder to turn off than on) and mains lead. Looking from the front again on the right side are, from front to back, a parallel expansion (for joystick controller or centronics printer), light pen port and serial port (a DIN socket) for modems and serial printers.

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

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

Lastly, on the numeric row of the keyboard, just about every abortive probability is catered for. Endless loop crashes may be exited by pressing the two keys marked 'reset' at the same time. They are on the right and left at the outside, so you have to be deliberate about using them. This seems overcautious if you consider that these keys do not affect whatever program material is currently in RAM. The break key stops the program at whatever point it's reached and leaves it there. Programs can then be resumed by typing 'cont'. Finally, the 'clear' key clears the screen and homes the cursor.

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

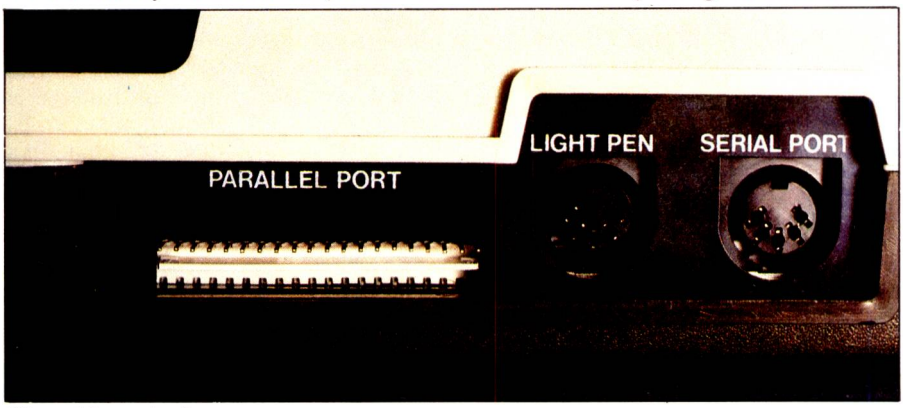
Moving on, the machine is opened by undoing three screws in little wells underneath at the front. These screws are even provided with little washers which I've never seen before on screws for a home micro. Once these are undone and put somewhere where they won't get eaten by the dog, you can lift the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

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

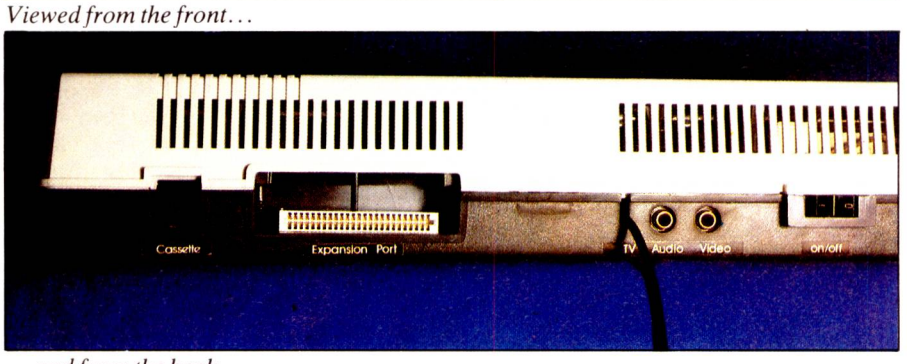
With the front of the machine facing

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

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



Viewed from the front...



...and from the back

Using the system

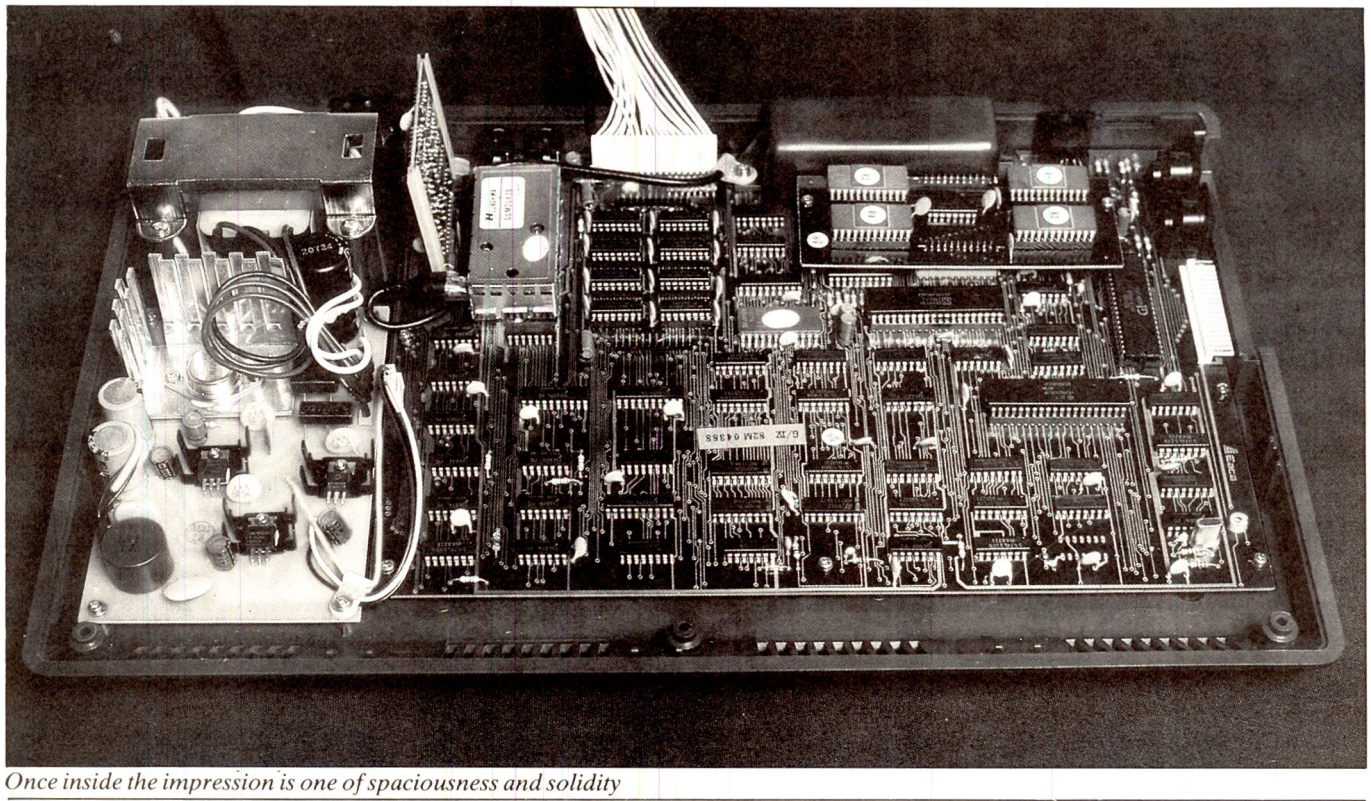
On power-up the machine asks you the enigmatic question 'MEM SIZE?' (hardly user-friendly). Default response is to press return, which affords the slightly more comprehensible 'COLOUR BASIC. READY' and a square cursor which flashes at a noticeably uneven and rather too rapid rate. (The cursor is programmable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

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

My programming ventures with the Genie began with some confusion. While the manual clearly stated that the machine has eight colours, other sources insisted the number is in fact 16. Even in the present manual (errors of this type are forgivable in a draft copy), it is maintained that the machine has eight colours. The truth is between the two. To get the full benefit of the Genie's colour capability you need to have the thing tuned in just right; it drifts off often and the AFC control will usually hold it. Otherwise the colours simply become shades of off-white. They're rather pastel anyway. The colours 9-16 are tones, not colours. To me they looked little different from the first eight colours but a difference can be seen if the TV is functioning correctly. Colour



The conventional 63 key keyboard



Once inside the impression is one of spaciousness and solidity

is controlled by the COLOUR command. At the same time, you are told in the manual that using the control key with one of the first eight colour numbers will change the subsequent display to that colour. On both the machines I tried, this failed to work consistently. The power-up colour is green. Colours range from white through orange and a slightly puce pink (red) to bluish hues and finally an almost invisible slate grey. These are text colours. The background colour is any colour you like as long as it's black (except in high resolution graphics where changes are possible)!

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

Microsoft Basic

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

Frankly, after a few complicated editing tasks I gave up altogether. Having to remember what 12 different keys do, and the formats by which one asks them to perform their often unnecessary functions, is too much. I retyped lines instead of editing them after that. It's far quicker.

Microsoft Basic is not, by today's standards, a structured or even very powerful language. Inasmuch as Basic is itself powerful, so Microsoft Basic has power. But it's old fashioned. You don't see such things as PROC or DO LOOPs, which make programming easier and more readable. The Colour Genie leaves out DEF FN as well, which is a disadvantage. Making whoopee with graphics and colour is also, is some respects, difficult as compared to other home machines. You have no flash facility and no inverse video (unless you want to program the whole character set to do it yourself and then it will only appear in squares rather than the whole screen). You can't change the background – no luminance, no double height or super/subscripted characters. Everything you want to do with this machine has to be done from scratch. To the more experienced user, it's a challenge. To the beginner, it's a maze which could be permanently offputting.

All the conventional areas in the Basic language are provided for in a Microsoft standard way. Arrays, strings (LEFT$, RIGHT$, ASC, VAL, STR$...), functions (SIN, CON, TAN, INT, RND...), loops (GOTO, GOSUB, FOR...NEXT (with STEP as well)...) and conditions with IF...THEN and AND/OR all pass the critical eye with little to report. The Genie, though, has some funny little idiosyncrasies which merit description.

If you have your wits about you when writing a program it is useful to be able instantly to classify variables before you start. DEFSTR, DEFINT, DEFDBL and DEFSNG allow you to do that. By typing in one of these commands and either a letter or range of letters, you can make all the variable names beginning with one of the specified letters strings, integers (this is a bit like a more comprehensive INT), double or single precision. There is no way, apart from looking back on your code or keeping a note on paper, of telling which variables defined under these commands do what. DEFSTR B, for example, does not give 'B' variables a dollar extension to say they are strings. While this is handy, it seems no more than a rather cosmetic measure.

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

The well-used ON ERROR GOTO phrase is oddly complimented by the addition of ERROR. ERROR followed by the specified error code (there are 22, each producing its own mnemonic when it crops up) will actually produce a reaction from the computer as if that error had occurred. That is, if you haven't had enough of errors already, you can make your machine bomb out whenever you feel like it. Perhaps in some applications

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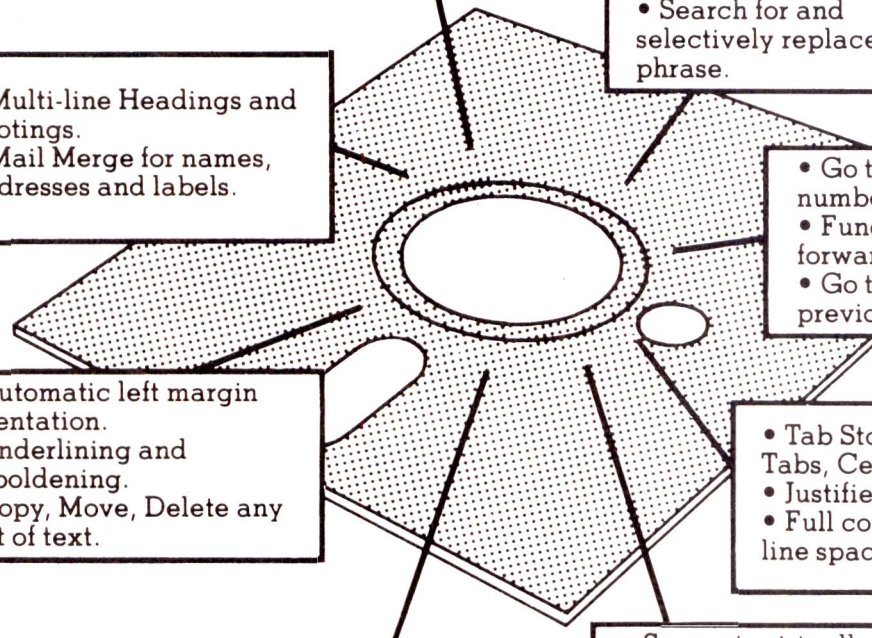

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programs it's helpful to be able to control the generation of error messages, but the use of ERROR on its own will not prevent the machine from crashing – quite the reverse, in fact.

Function keys

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

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

Graphics and colour

The graphics, as I said before, are not easy and are initially confusing to use. The Genie has two screens in video RAM at any one time. There's the LGR page and the FGR page. These mnemonics are also Basic commands to switch you from one to the other from within a program. In direct mode you can toggle between the two using control and 'MOD SEL' together to go from low to high, and the reset keys to go back again. Commands can be executed on the FGR page without being displayed. The FGR command is necessary to change the display from high to low resolution.

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

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

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

COLOUR GENIE

FILL will colour the screen with any one of the four high resolution graphics colours – green, blue, orange or black.

PLOT ... TO and NPLOT are quite a powerful and easily memorable combination of line drawing commands. PLOT and PLOT ... TO put points or draw lines on the screen. NPLOT 'undraws' them.

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

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

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

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

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

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

Sound generation

The programmable sound generator AY38910, is in use in quite a few computers and sound boxes these days. The Genie controls it with two Basic commands, SOUND and PLAY. PLAY is the musical one. The parameters are channel number (there are three channels), octave (there are eight), note (from one to 12) and amplitude (from one to 15). Using this command you can make some interesting sound effects as demonstration software indicated. But under this control there is no facility for specifying note duration. Therefore a note will continue until it is replaced by another or a command given to make it stop. This I found rather an important omission.

SOUND is a command operating on a lower level than PLAY. The chip has 16 registers and SOUND sends values to different registers depending on the sound wanted. It is possible to generate sound envelopes using this command. Gunshots, lasers, explosions and electric piano notes can be produced quite easily with this command. Since sound comes from the TV loudspeaker instead of a little cheap one inside the computer, the quality is pretty high.

Add-ons

The expansion capabilities of the Genie are fair. Disk drives will be launched soon, probably with a 'GenieDOS' rather than something like CP/M. A space is already reserved in memory for disk I/O. Two printers are currently available for the machine – the EG3085 which is the same machine as the new Apple printer, but £60 cheaper, and the EG603, which is substantially cheaper than the 3085 (which is actually more expensive than the Genie itself ...). Both are dot matrix; the 3085 printing at 120cps and the 603 at 80cps. You have to buy a cable (at £39.50) to run either printer from the Genie, and this enables you to run any Centronics compatible printer. A light pen will be

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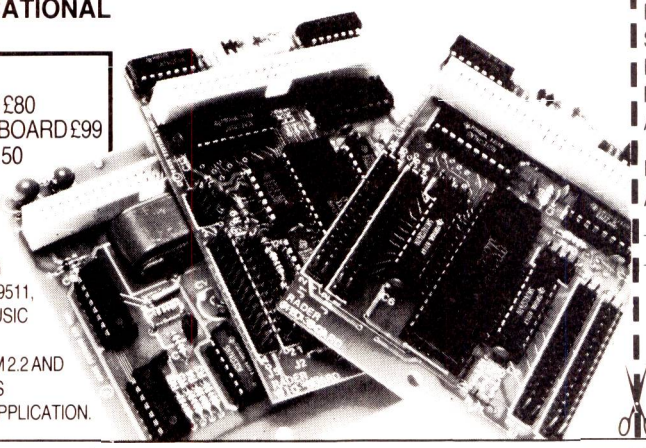

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available sooner or later, but the demand for them does not seem too high at present. It could be some time.

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

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

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

Benchmark timings

BM1	2.7
BM2	10.6
BM3	25.0
BM4	25.8
BM5	28.9
BM6	47.8
BM7	73.1
BM8	104.3
Average	39.8

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

COLOUR GENIE

Software

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

The Genie's software library is quite big. It includes games, like the ones I've already mentioned, adventures, programming tools (eg, monitors, etc) and utilities such as file handling.

In addition the Colour Genie User Group will shortly be providing a regular (probably monthly) magazine for its members. At the time of writing, Chewing Gum issue one was just about to go to press and includes news, programs and tips and a spot on software – including complaints about the ones to avoid. The user group is in the process of building up a big software library. Lowe Soft, Lowe's inhouse software distributor, will be commissioning and distributing software – some of it for educational purposes.

Documentation

The manuals for this machine are, frankly, awful. Machines which have been in the shops since before Christmas (yes, there are a few) will be supplied with the most incomprehensible draft manual you can imagine. A proper manual is now available but this is also pretty unhelpful. Neither pretend to teach you how to program (it's just as well) but they do both claim to be sources of reference.

Nor do either of them fulfil that purpose properly. Not all keywords are explained; only the graphics ASCII codes are listed in the new manual (not the alphanumerics); there is no contents page and no proper, itemised index of Basic commands. The English is also a bit difficult to understand at times. This is almost certainly due to the fact that EACA probably wrote the original in Chinese and translated it directly into English. The grammar is, at times, quite amusing. Nevertheless, the new manual does provide some useful little programs and what it does explain is quite clear once you've read it over two or three times. A technical manual is on its way which will provide much more information for the programmer who really means business. Regrettably, I was unable to get my hands on one.

Prices

16k Colour Genie £199
RAM expansion £38.50
EG3085 printer £410.55
EG603 printer £270.25
Printer cable £39.50
Disk drives N/A
Light pen N/A
(All prices include VAT)

Conclusions

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

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

Lowe is aiming this machine at the 'games plus' buyer – ie, the knowledgeable enthusiast – and this is where it will go. I can't see it being a machine which will be a first time buy, mostly because it is quite complicated to use. It's a more subtle creature than the zapping, blasting, brightly coloured boxes of tricks people want to buy these days but, judging by the software I've seen on it, great things are possible.

END

Technical Specifications

CPU:	Z80
RAM:	16k (expandable internally to 32k)
ROM:	16k
Keyboard:	63 key typewriter quality. 4 programmable function keys. Graphics/lower case directly available. Qwerty layout.
Display:	UHF TV 40x24. High resoluion graphics 160x96. RGB monitor option.
I/O ports:	Cassette, serial, parallel, audio, light pen, ROM cartridge, expansion bus.
Expansion:	Disks/light pen coming. Printer available. ROM cartridges also available.

SCREENPLAY

Steve Mann looks at games for the Oric-1 and Jupiter Ace

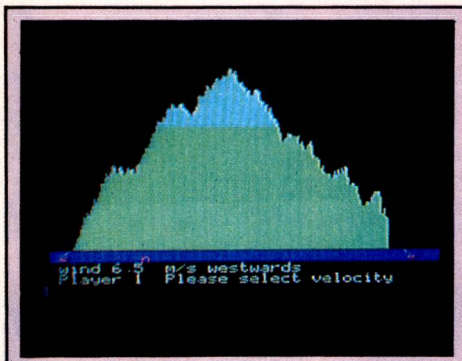
This month's Screenplay sets a precedent by looking at games for two different computers, both of which have appeared in the shops in the last few months.

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

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

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

The Oric-1 has met with its fair share of brickbats, but this is more to do with the hurried way it was launched in unfinished form rather than any intrinsic faults in the computer itself. The Oric I used for this Screenplay was one of the early review models — as yet I have been unable to get my hands on a version containing final ROM chips, so I cannot say whether any derogatory comments I have made here will apply to the final production models.



ORIC MULTIGAMES

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

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

Multigames is a fairly standard compilation of simple computer games; they are all the sort of programs beginners are encouraged to type in for themselves as a means of learning about programming.

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

'Projectiles' is 'Duckshoot' in disguise — instead of lobbing your artillery shell over a moon and down on the unsuspecting waterfowl, you have to shoot over a mountain range in the middle of an island. You have one gun, the computer has another and you take turns in feeding in shell velocity and the angle of the gun barrel. After a successful shot the screen clears and a new island is drawn. Nice graphics on this one, but the game itself is very boring.

'Colour Match' starts with a mistake on the title page — someone hasn't quite got the hang of the strange Oric attributes, and instead of the title in double-height characters you are greeted with a long black strip and no text.

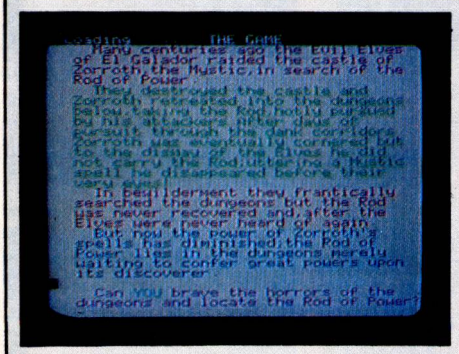
The game itself is 'Mastermind' — you have to guess the sequence of colours generated by the computer.

'Quest' is, as you'd expect, a mini-adventure. You start in a cave in the woods and have to go in search of pirate's treasure. It's amusing enough, although hardly intellectually taxing, and the small vocabulary results in instructions being carried out quickly.

The last program on the tape is 'Reversi' which the whole world knows as 'Othello' but which everyone has to call 'Reversi' to stop Mine of Information slapping a writ on them. Disappointing graphics here — it would have been nicer to have had user-defined graphics for board and pieces. It's also slow —the Oric takes over two minutes to respond to a move.

All in all, then, there's nothing outstanding here. This is the sort of thing that would make a good 'Welcome' tape to be included in the box with the computer — but I can't really see the point of marketing it as a commercial piece of software. It seems overpriced at £7.95.

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



DUNGEONS OF INTRIGUE

Supplier: ASL Software
Price: £5.50 (48k Oric)

This game was supplied to me on a cassette with Stock Exchange (see below). This is not the format that will be used when it is marketed commercially, and I hope that there will then be two different versions, one for each baud rate. The version as supplied was for the fast, 2400 baud format, and unfortunately I had great difficulty in persuading it to load. It seems a common quirk of the Oric that at the faster rate it manages to lose the dollar sign from string variable names, resulting in a syntax error. I finally managed to get the game to load, but then had to go through the listing to correct many of the program lines before it would run. I thought I'd caught all the mistakes and started playing the game, but in fact I'd overlooked at least one and eventually I was forced the give up. I thing this is going to be a common problem with Oric software; because of the discrepancy between the two baud rates, you either have to take a chance on your program loading at the faster speed or wait an eternity for the program to load at slow rate, which is very reliable. In fact, the faster speed seems to be perfectly okay if programs are loaded back from the recorder on which they were saved — ideally the manufacturers should give you the option

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

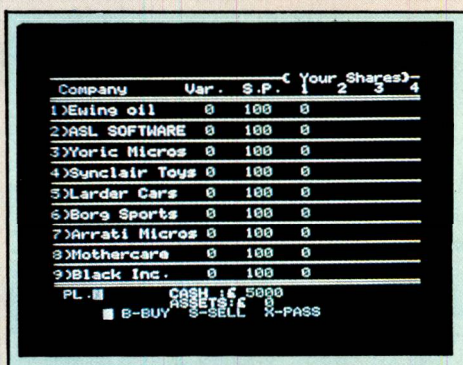
Anyway, back to the Dungeons . . . First of all, the instructions load and stay on screen as the game proper is loading. This scenario is as follows — the Evil Elves of El Galador raided the castle of Zorroth the Mystic, in search of the Rod of Power. Zorroth fled into the castle dungeons, where he was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

At the start of the game you are given a random set of attributes, covering strength, wisdom, intelligence, constitution, dexterity and charisma. From these attributes you decide on your role — fighter, magician, priest or dwarf. You are then given a certain number of gold coins with which to buy objects that will be useful in your quest — dagger, sword, javelin, club, elixir of strength, oil flask or your lantern, holy water, shield, leather armour and axe.

I'd got as far as deciding that I should be a magician (after all, I was given 19 for intelligence and wisdom and 14 for charisma) and I'd selected the elixir, the dagger, the holy water and the oil before I was forced to give up in frustration at yet another 'type mismatch' error report.

It's a pity — I think I'd have really enjoyed this game; the overall presentation was good, the instructions were clear and straightforward and it looks as though it would be a lot of fun to play. I'm sure that by the time you read this the production version will be on the market and the loading problems overcome — if this is the case I'd recommend that you take a look at Dungeons of Intrigue.

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



STOCK EXCHANGE

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

This game came to me on the other side of Dungeons of Intrigue, but is being sold as a separate piece of software with an 'Etch-a-Sketch' program on the other side. The same difficulties in loading were experienced as with Dungeons, but after changing some program lines I eventually got it up and running.

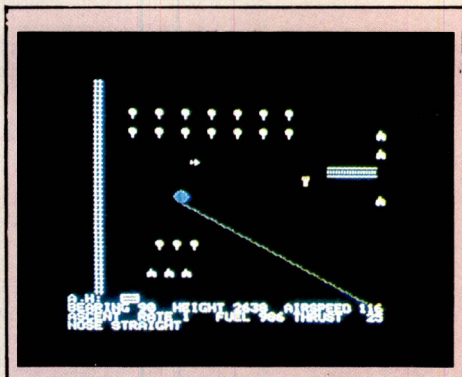
The aim of the game is to make a killing on the stock market. You start with £5000 and have the option of buying or selling shares in a range of companies like Ewing Oil, Yoric Micros, Synclair Toys, Borg Sports, ASL Software and Mothercare.

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

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

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

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



FLIGHT

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

This is a very simplified flight simulation for the Oric-1 — but it's so simple it hardly merits the name 'simulation'; it's more a game than a program to help you understand the controls of an aircraft. This time there were no loading problems: using the CLOAD "name",S format may take a long time but it sure is reliable.

The program starts with the Oric playing 'Those Magnificent Men in Their Flying Machines' and a series of on screen warnings telling you to extinguish your cigarette and fasten your seatbelt. You take control of the aircraft while it is in mid-flight and your only task is to get it down on the runway in one piece. Your controls are as follows: 1 turns your craft in an anticlockwise direction; 2 keeps you moving straight ahead; 3 turns clockwise; left cursor decreases thrust; right cursor increases thrust; up cursor pulls the plane's nose up; down cursor sends you into a dive.

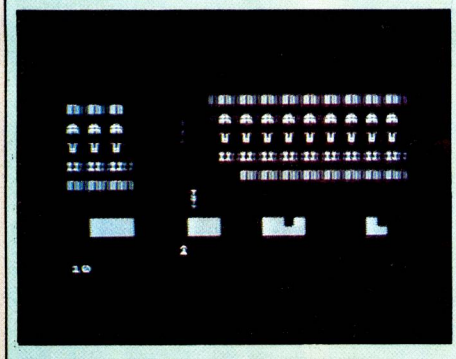
Your position, speed and thrust are shown digitally and are updated every second. To land successfully you have to come in at a speed of less than 90 mph, at a gentle angle and at an alignment of 90 or 270 degrees (due east or west along the runway).

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

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

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

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



ACE INVADERS

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

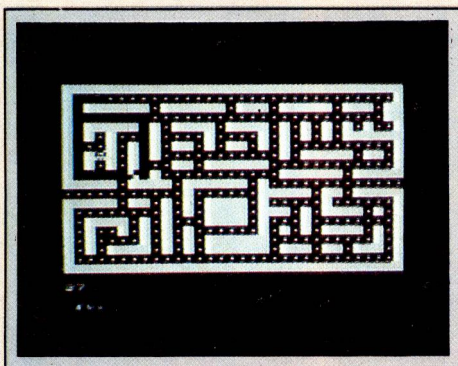
This is getting boring — again I had difficulty in getting this program to load, but in this case it was because of wrong instructions. The program loads in two parts and you have to type in four separate instructions for successful loading. The Ace distinguishes between upper and lower case and, whereas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

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

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

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

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



MICRO MAZE

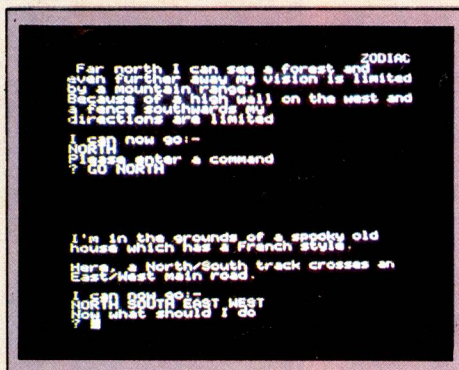
Supplier: Hi-Tech
Price: £6.50 (unexpanded Ace)

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

Micro Maze is a simple Pacman-style game. You roam the maze, eating as many radioactive dots as you can, and keeping an eye open for the pursuing monsters. If you manage to clear one maze of all the dots, the screen clears and you move onto a higher level — with the monsters getting quicker, and much more likely to catch you. That's all there is to it — there are four levels of skill and you automatically move onto the next level as you clear the screen. You also have a choice of three mazes, which are selected by typing either '0 0 BLOAD screen2' or '0 0 BLOAD screen3'.

I found this game surprisingly enjoyable. Its best friends would hardly call it sophisticated, and the graphics are somewhat on the simple side but, given these limitations, it is surprisingly addictive. Certainly worth a look if you own an unexpanded Jupiter Ace.

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



ZODIAC

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

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

This is a well put-together adventure that features a very large vocabulary and which uses the large amount of available memory to very good effect.

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

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

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

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

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

FAIRE FADES

The ubiquitous Peter Rodwell crossed the Atlantic for the great Californian non-event of the year; otherwise known as the West Coast Faire.

Hot air

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

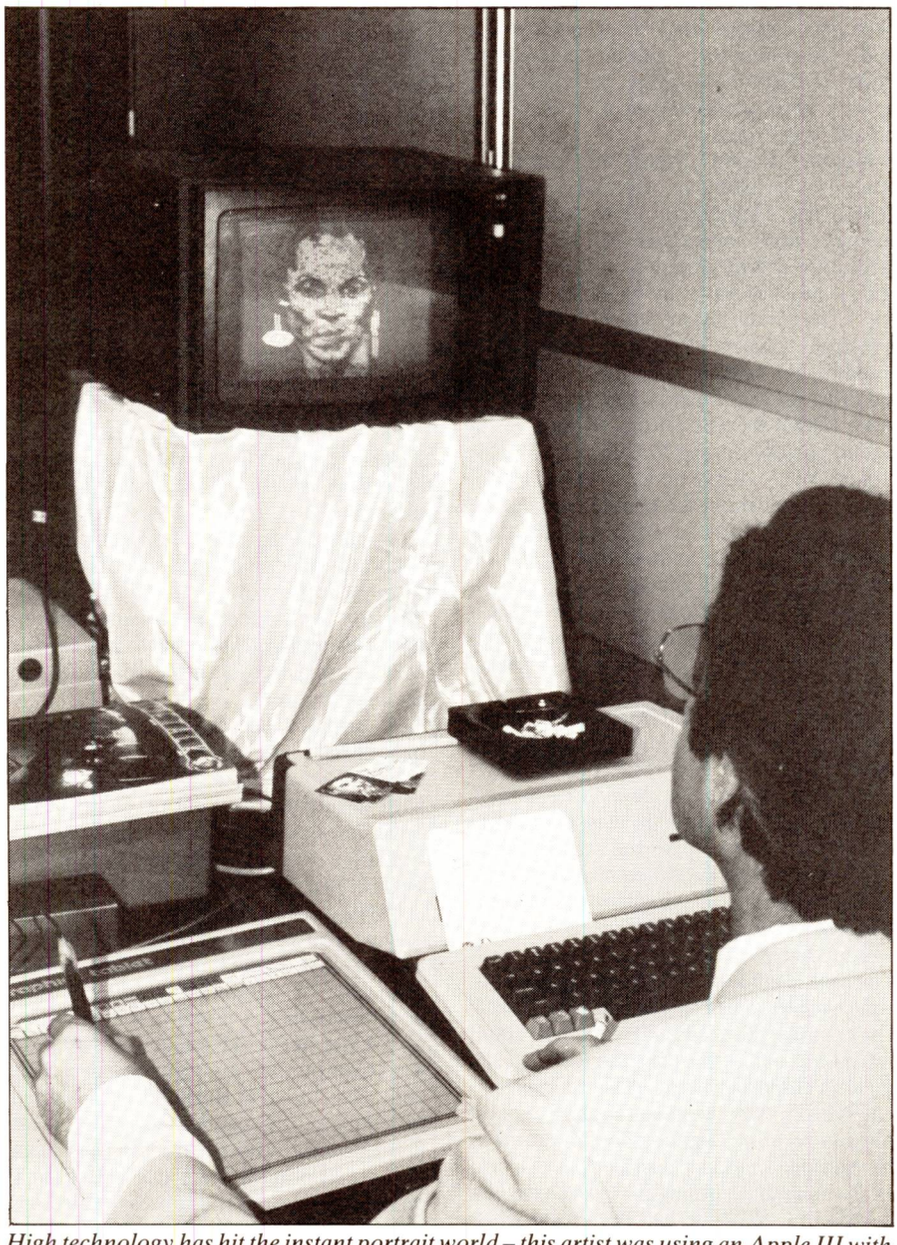
And indeed he was right. There was no shortage of exhibitors (400-plus) or visitors (46,900 — a little more than last year's *PCW* Show) and could be counted a success numberwise. But there was something missing. There was nothing *new*, nothing that made you stop in your efforts to squeeze past vast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

In case you think that I'm so jaded by international jet-setting that not even a trip to California can get the adrenalin flowing, let me explain. I have in the last year attended shows in Britain (several), Amsterdam, Madrid and Tokyo and, with the exception of Amsterdam (Comdex, a terrible show), found something of interest, novelty, originality and/or amusement. Tokyo gave a fascinating insight into the Japanese home market and provided a preview of what we can expect to see pouring over here in the near future. Madrid had little in the way of innovation but made up for this with all the enthusiasm and vigour of what must be one of the fastest-growing micro markets in Europe. The British shows proved that we are the masters of software innovation and can still teach the Americans and Japanese some pretty strong lessons about designing and making hardware, too. Travelling to California to visit the major micro show in the very heart of the industry, one expects even greater things. After all, this is where the industry started and where a lot of the innovating — in hardware if not in software — still happens these days. Perhaps I was expecting too much — although I don't think so — but I certainly left a rain-sodden San Francisco at the end of the Faire with a feeling of disappointment.

IBM PC monopoly

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

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



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

FAIRE FADES

the 20 or more American books which have appeared here since IBM's Eurolaunch, on subjects like *Games Programming on the IBM PC* or *Programming Your IBM For Fun and Profit*. There will even be an IBM PC Faire in San Francisco this year (26-28 August), apparently organised by the WCF organisers.

Some diversions

But enough of this negative talk. There were, in fact, a few things of interest at the Faire even if they weren't revolutionary advances in computer science. My personal 'best in show' award went to the Vectrix Corporation for its spectacular colour graphics add-on subsystem powered by its own 68000 and producing some really spectacular displays. It can, apparently, be used with virtually any microcomputer and can easily be controlled from whatever high-level language you like. Regrettably, a pretty impressive collection of Californian beer guts insisted on jostling my camera and prevented my getting a sensible photo of the demo display, so you'll have to wait until we Benchtest it — it will be on sale here soon.

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

Quite a few of the big industry names were there, including Commodore, Apple, IBM (of course) and Osborne. The last name was said to be launching a new machine and although it was eventually announced, it wasn't on the stand. Adam Osborne was, though, when he could shake off the entourage of sycophants who seem to follow him permanently these days; word was out that he'd been the victim of a boardroom battle but he was still smiling. One big name noticably missing was Digital Research. The company booked (and paid for) a stand but pulled out at the last moment, to the obvious embarrassment of Faire supremo Jim Warren, who went so far as to explain this and re-print Digital's booking form in the catalogue, adding nastily, '. . . we sincerely hope that nothing is seriously wrong at DRI . . .' Well, he had been using Digital's booking as a selling point and its non-appearance must have caused him a few awkward moments.

The Apple stand was interesting. A few people gave the IIe an interested glance or two and nobody seemed to have time for the III. No, they all wanted to see Lisa and there she was, out of reach at the centre of a 20-deep crowd, showing off her fancy dis plays to the accompaniment of a dreadful stand-up comedian. I never did manage to get close enough to see whether they'd corrected the now-famous spelling mistakes. . .

Commodore's stand had little of interest other than a 700 with real, working disk drives (as opposed to the cardboard mock-ups they've been using in some of their ads and brochures — what, you hadn't noticed?). Likewise, IBM had the new XT model but not much else to rave about. Texas Instruments had a large stand, too, and was showing off its new home machine, the TI-99/2, an under $100 micro with 4.2k of RAM (expandable to 36.2k), TI Basic in ROM and a black and white display. The display gives 24 lines of 28 characters and there's a promised range of peripherals which include a printer/plotter, a 'Wafertape' mass storage device and an RS232 interface. I also picked up a brochure on — but don't remember seeing — the TI Compact Computer 40, aimed obviously at the Epson HX-20 with a built-in 31-character LED display (single line), 6k RAM expandable by 16k, 32k of ROM and the same peripherals as the '99/2. It can also take software in the form of ROM cartridges and its suggested retail price is $249.95.

Portability

It took the full three days of the Faire to visit every stand, look at whatever was on show, and, where necessary, talk to the

Cruising down El Camino

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

The Unit is an offshoot of the Humanities Computing Service and aims to spread technology awareness among members of the Humanities Department and to provide access to microcomputers. Currently, the Unit is pretty small but has big plans: a classroom full of micros, networked together, is what director Ann Hernandez aims for, to allow teacher and students to work using computers as tools, rather than to learn *about* computers.

A primary use is, of course, word processing and work is under way teaching students to write their papers with Wordstar. But more exotic tasks have been tackled, including the invention of a way of computer typesetting ancient Icelandic characters.

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

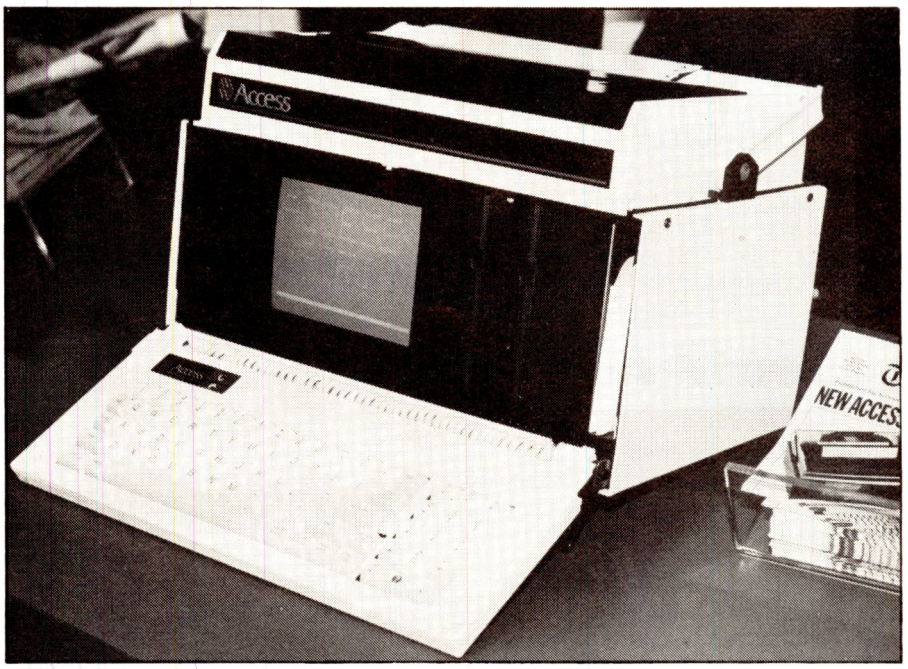
Berkeley's Professor Brian Barsky is one of the leading experts in computer graphics, and I called in to see him. Quickly masking his obvious annoyance at this unscheduled visit, he demonstrated an example of the sort of work being carried on there. A tiny room housed four research students, four terminals and a colour graphics display, all (except the students) connected to a VAX with some fancy graphics hardware hung onto it. One of Prof Barsky's achievements has been the development of a special branch of maths for use in the representation of three-dimensional objects. To describe an object, a series of points about its boundary are defined; linking these up gives a 'faceted' representation and Barsky has introduced a system for 'smoothing out' the facets, incorporating a 'tension factor' which allows you to vary the amount of smoothing, from very angular to completely smooth. He demonstrated this with a very impressive display of several objects, including an irregular one, each with varying tension factors; as always, they had a strange, unearthly look to them which, it later occurred to me, was because they were 'too perfect' – real-world artefacts have slight imperfections, but introducing this to a computer graphics system would, I imagine, be far from trivial. The Berkeley graphics work is very, very impressive and I can't wait for hardware prices to fall to the point where we can achieve this sort of thing on personal computers. I left promising that next time I was there I'd make an appointment and go into the subject in greater depth – and I will.

relevant people. Before long, the two big trends in current hardware became apparent. Everywhere there were IBM lookalikes, portable computers and, in quite a few cases, portable IBM lookalikes from those riding both bandwagons. I must confess that I have long suspected that the success of the Osborne owes more to its price and bundle of software than to its portability; despite the very large number sold, I have never actually seen anyone using a portable machine in anything other than the sort of environment — office or home — where mains power is available and where a proper business machine would serve them far better. I am prepared to admit that some people need — and might even use — a truly portable computer, but I see no evidence that the success of the portable is due to its portability. Surely, though, I must be quite wrong for everybody is producing portables, often costing much more than the Osborne and offering less software, although, to be fair, they are usually better made and have larger screens. Given that the portable is selling well and that the IBM is moving in telephone number quantities in the States, it's hardly surprising that IBM-compatible portables should be the machine to make. Most seem similarly priced to the IBM and offer slightly more, particularly in the way of I/O ports. The nicest looking at the Faire was the Canadian-made Hyperion, now available in the UK from Gulfstream Technology and in the guise of The Ajile from Anderson Jacobson.

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

Mice mania

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



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



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

Down in the valley

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

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

FAIRE FADES

moving parts to wear out; the software is far simpler; and you don't need to keep an area clear on your desk top. The situation is especially silly when you consider that many modern display controller chips contain built-in light pen interfaces anyway.

Colourful display

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

Light relief

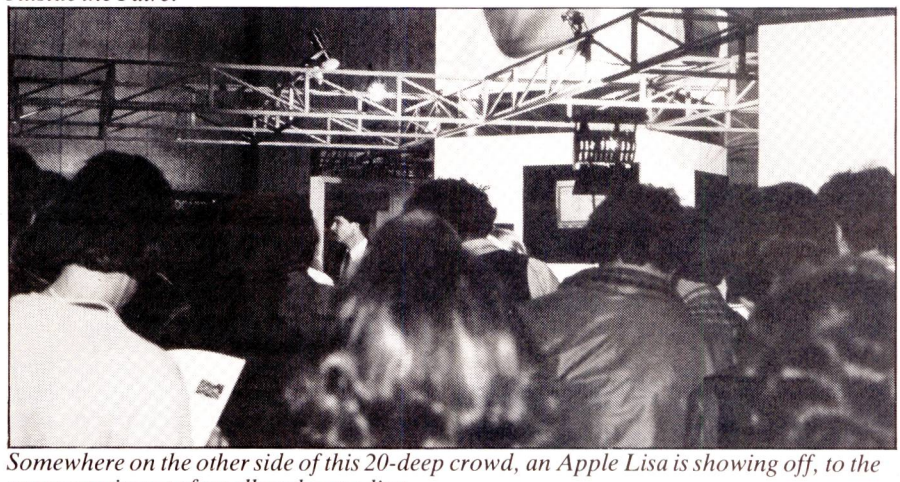
If the Faire was lacking in novelty and originality productwise, it still provided occasional flashes of entertainment in the form of the people there. There were of course the usual promotional gimmicks: I spotted a caveman, a penguin, several robots, an ET and a gorilla (or he might have been a bear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

Conclusion

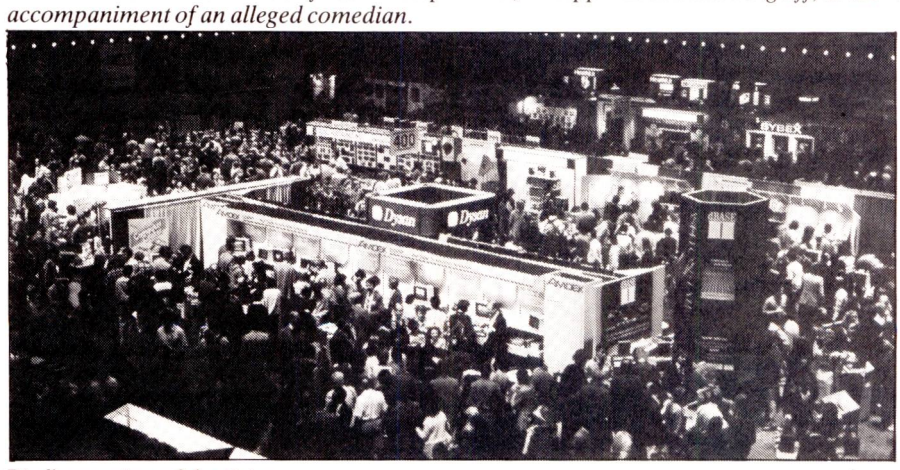
In summary, then, was it an event worth flying the Atlantic to see? My answer would have to be a qualified 'No'. Had I gone to California just to see the Faire in the expectation of great things, I would have been even more disappointed. Fortunately, the presence of Silicon Valley just down the road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



You really know it when you're in Silicon Valley – this car licence plate was spotted just outside the Faire.



Somewhere on the other side of this 20-deep crowd, an Apple Lisa is showing off, to the accompaniment of an alleged comedian.



Bird's eye view of the Faire

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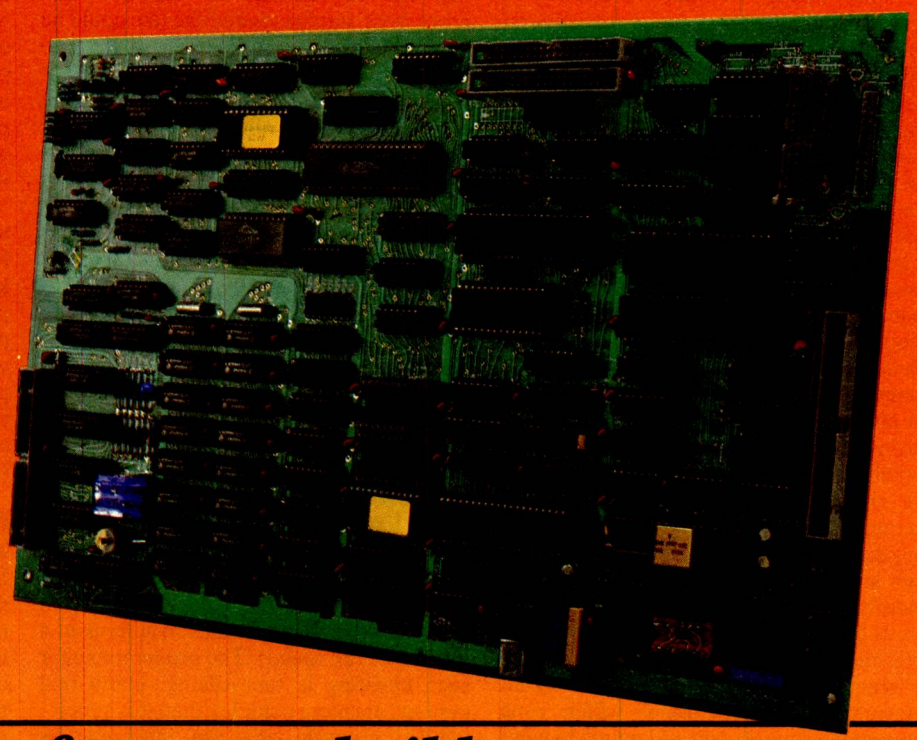

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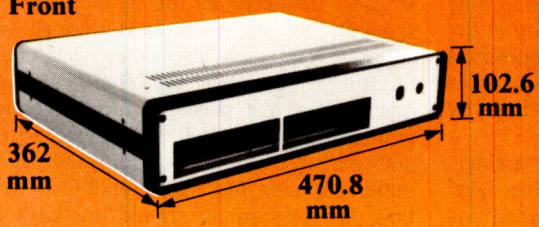

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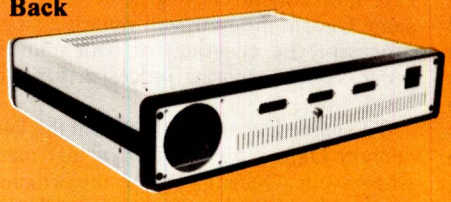

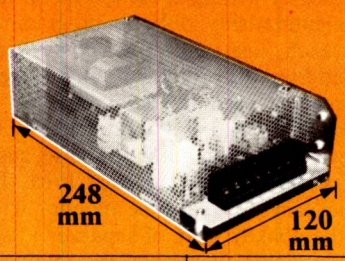

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OCCAM OCCULT

PROGRAMMING IN PARALLEL WITH OCCAM

Dick Pountain unravels the fifth generation systems programming language, eponymously named Occam.

I take it as evident that most *PCW* readers are smart enough to walk and chew gum simultaneously. Most microcomputers, however, are not. In the real world lots of things tend to happen at the same time, to the point that we take such behaviour for granted and seldom question it. When you make breakfast, it's quite natural to have the toast under the grill at the same time that the eggs are boiling and the tea is mashing in the pot.

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

Why concurrency?

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

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

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

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

The approach of using more than one processor is used in big defence mainframe systems and in a more modest way in the Atari, the TI99 and the Commodore 64 which achieve their concurrent graphics processing ('player/missile' or 'sprites') by using 'smart' video chips.

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

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

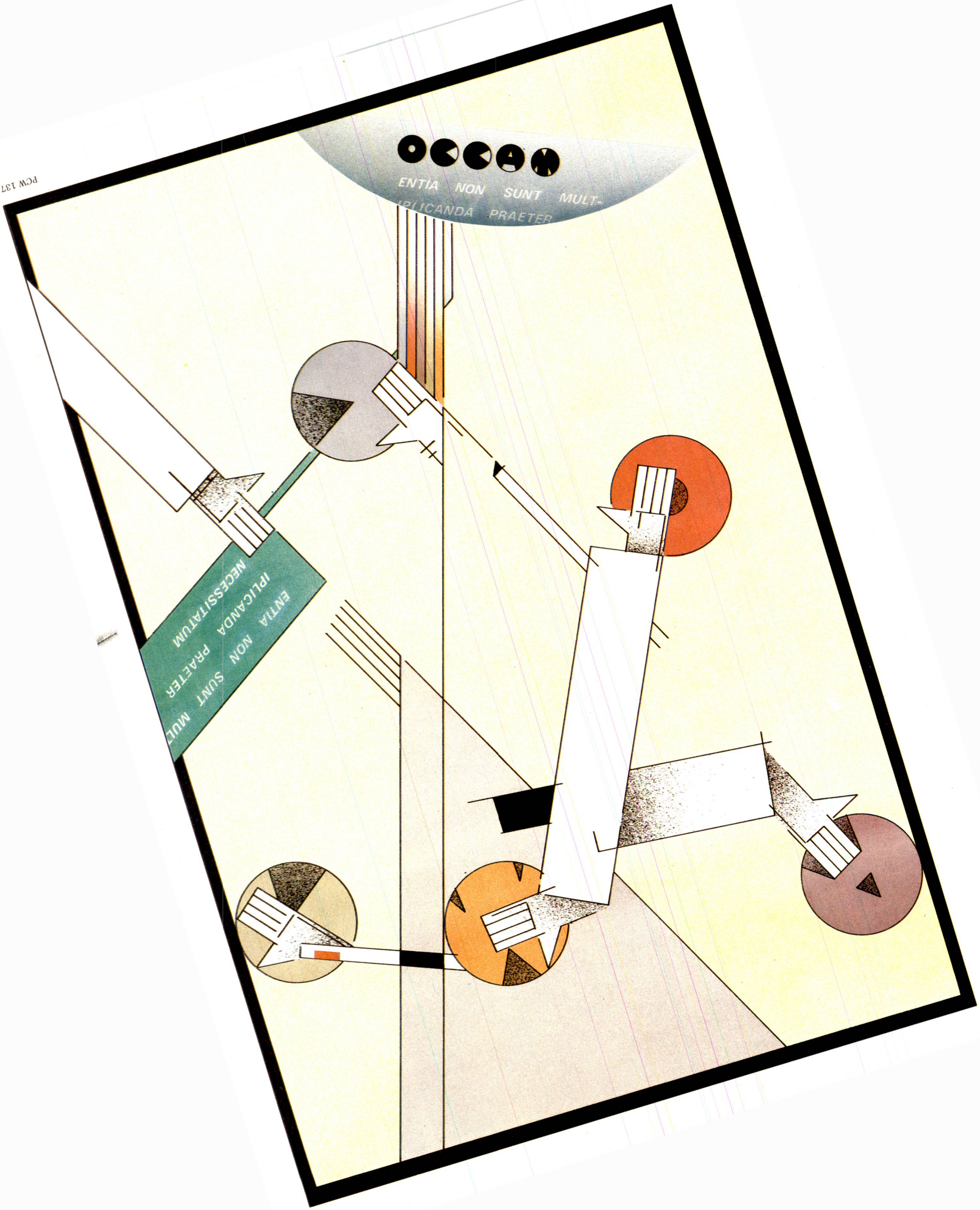
To achieve concurrent programming in a high-level language, the facilities have to be built into the language. The most well known example is Ada, which has a program construct called the 'task' for this purpose. Tasks communicate by shared variables and by flags (often called semaphores). Some Pascals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

Occam's razor

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

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

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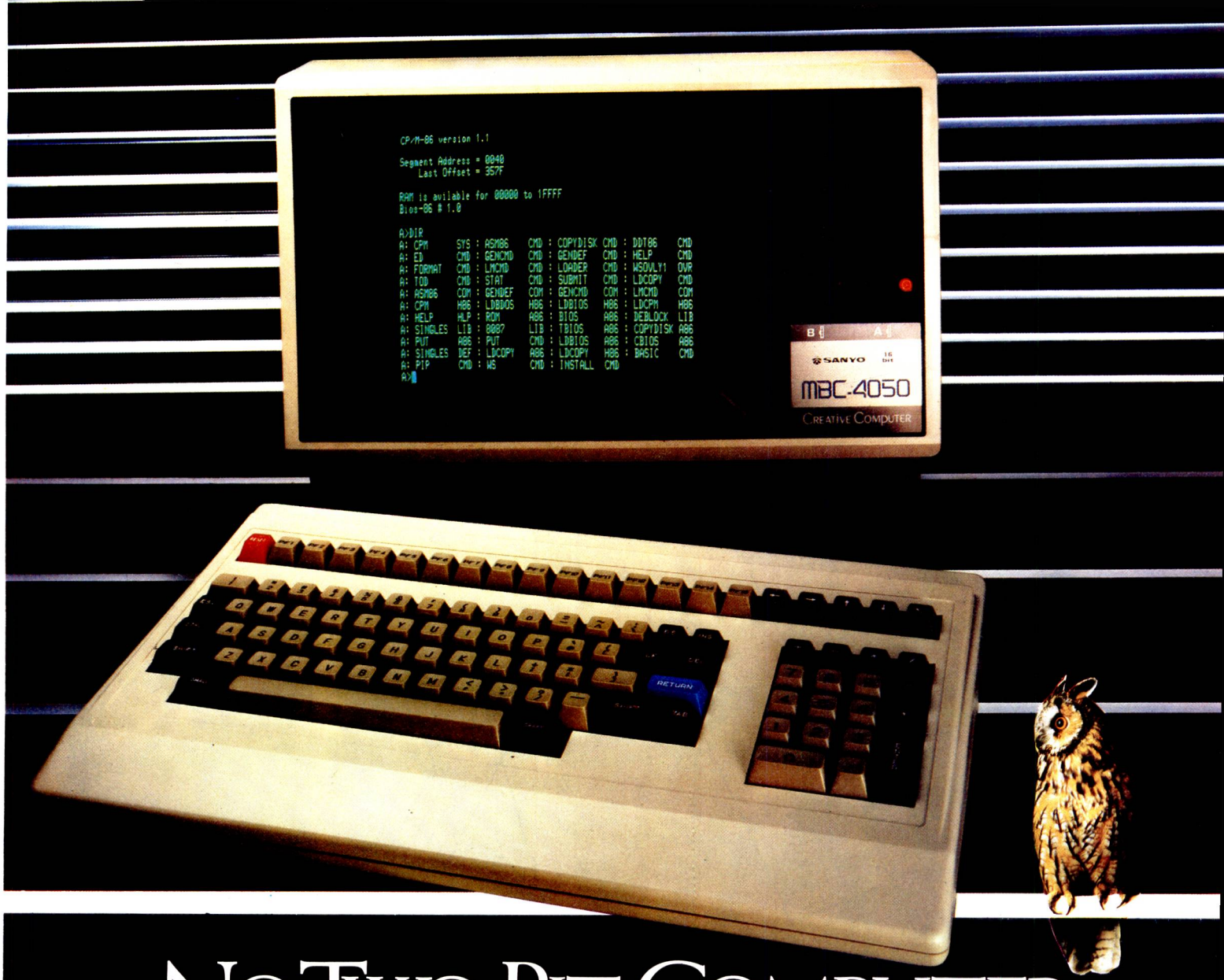

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style of protecting programmers from themselves to new heights, with minutely detailed restrictions on the scope and type of every object and a large number of objects. Occam on the other hand is very spare and elegant, having only 22 reserved words and five basic constructs from which all else is derived. Hence the name.

How Occam works

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

The unit of Occam programming is the 'process'. A process performs a sequence of actions and then terminates. Note the time element creeping in here; in a Basic program you never think about a program terminating because it's so obvious that it must.

There are three fundamental types of process:- input, output and assignment.

I'll illustrate with a channel called 'keyboard' and 'screen' and a variable called 'store'.

Input transfers a value from a channel to a variable and is written:-

```
keyboard ? store
```

Output transfers a value from a variable to a channel and is written:-

```
screen ! store
```

Assignment puts the value of an expression into a variable as in most languages:-

```
store := store + 1
```

When a value is transferred down a channel, it is in fact only a copy of the value; the variable which performs the output retains its same value. This is one of the ways Occam (and many other modern languages) minimises the possibility of unwanted side-effects in a program; the only way to change the value of a variable is to consciously assign or input to it.

Constructors

All Occam programs are built from these processes using a set of 'constructors' to string them together. Complete programs also need some declarations, similar to Pascal or C. Some wirthy (sic) citizens may have pricked up their ears at the word 'value' used above. Yes, it's true, Occam is untyped, a value being merely one word regardless of its meaning. Occam is intended for system programming and is lower level than Pascal in this respect, more like Forth. For instance, it only has integer arithmetic (16-bit in the Sirius version). A simple Occam program would look like this:-

```
CHAN comm1,comm2:
VAR temp:
SEQ
  comm1 ? temp
  temp := temp + 100
  comm2 ! temp
```

Notice the declaration of the channels and variable used. In Occam these are both always local declarations; the channels and variable are set up only when this process executes, and are deallocated immediately afterwards. Notice also the word SEQ; this is one of Ocam's constructors, and it declares that what follows will be executed SEQuentially as in an ordinary Basic program. The indentation is not optional but highly significant as it indicates the scope of the SEQ construct. Occam has a smart editor which, in addition to checking syntax, handles this indentation for you automatically. This program inputs on channel comm1, adds 100 to the input value and outputs it to comm2, doing this once only. (The assignment is actually redundant as I could just say comm2 ! temp + 100.)

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

The program above could be made into a named process by declaring it so:-

```
PROC add100 (CHAN comm1,comm2)
=   VAR temp:
    SEQ
      comm1 ? temp
      comm2 ! temp + 100:
```

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

```
add100(keyboard,screen)
```

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

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

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

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

An example of parallel processes is:-

```
PAR
  WHILE TRUE
    VAR x:
    SEQ
      comm1 ? x
      comm2 ! x

WHILE TRUE
  VAR y:
  SEQ
    comm3 ? y
    comm4 ! y
```

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

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

```
WHILE TRUE
  VAR x:
  ALT
    comm1 ? ANY
      SEQ
        x := x + 1
    comm2 ? ANY
      SEQ
        x := x + 100
```

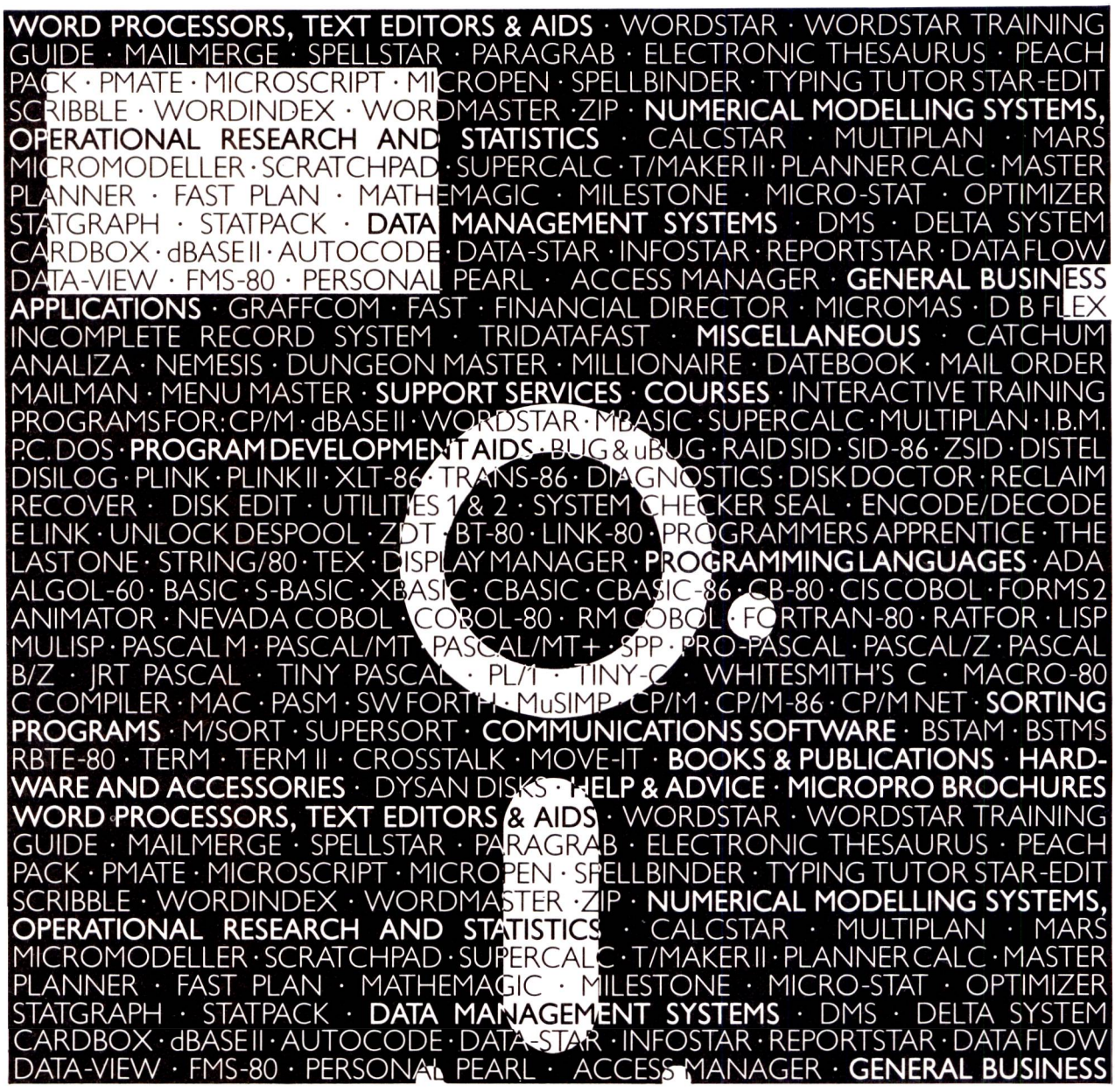
This will add either 1 or 100 to x depending upon which of comm1 and comm2 produces its input first; the input processes which ALT selects from are called 'guards'. Should both guards come ready simultaneously, then Occam will

```
CHAN values[n+1]:
PAR
  PAR i = [0 FOR n]
    WHILE TRUE
      VAR x, Estimate:
      SEQ
        values[i] ? x
        values[i] ? Estimate
        values[i+1] ! x
        values[i+1] ! (Estimate+(x/Estimate))/2
  WHILE TRUE
    VAR x:
    SEQ
      Sq.root ? x              -- input initial value
      values[0] ! x
      values[0] ! x/2          -- form initial estimate
  WHILE TRUE
    VAR root:
    SEQ
      values[n] ? ANY
      values[n] ? root         -- receive final estimate
      Sq.root.result ! root
```

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

AFTER	FOR	TABLE
ALT	IF	TRUE
AND	NOT	VALUE
ANY	NOW	VAR
BYTE	OR	WAIT
CHAN	PAR	WHILE
DEF	PROC	
FALSE	SEQ	

Fig 2 The Occam reserved words



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

```
ALT
  x < 0 & comm1 ? ANY
```

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

Real time processes

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

```
VAR alarm:
SEQ
  alarm := NOW + 100

ALT
  comm1 ? ANY
    SEQ
      — some action
  WAIT NOW AFTER alarm
    SEQ
      — ring a bell
```

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

The IF construct is very simple, with no THEN or ELSE. Each following process begins with a condition and IF executes the first (in program sequence not time) one which is TRUE. If none is TRUE the process has no action:-

```
IF
  x=0
    screen ! y
  x=1
    printer ! y
```

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

```
SEQ i=[1 FOR 20]
  screen ! i
```

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

```
CHAN k[n+1]:
PAR i=[0 FOR n]
  WHILE TRUE
    VAR x:
    SEQ
      k[i] ? x
      k[i+1] ! x
```

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

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

```
WHILE TRUE
  VAR x:
  ALT i=[1 FOR 100]
    chan[i] ? x
    out ! x
```

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

Data structures

You have just seen another type of Occam data object: the array. Arrays of channels or variables can be constructed by adding the upper bound in square brackets when declaring them, eg, VAR varieties[57]:. If the word *BYTE* is included, a byte rather than word array results, eg, VAR alphabet [BYTE 26].

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

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

```
DEF string = "what the hell"
SEQ i=[1 FOR string[BYTE 0]]
  screen ! string[i]
```

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

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

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

```
PROC str.to.screen(VALUE string[] =
```

The compiler

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

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

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

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

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

END

CHECKOUT

HEARING IS BELIEVING

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

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

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

For decades, people have been spending an awful lot of money trying to reproduce recorded sound as faithfully as possible in the comfort and privacy of their own homes. The last great revolution was the development of the LP record and shortly after that the widespread introduction of stereo sound. Both brought immense improvements over the previously popular medium, the 78rpm record, in terms of frequency response, dynamic range and reduced noise. Corresponding developments to other parts of the audio chain – microphones, tape recorders, amplifiers and loudspeakers, for example – have brought reasonably good sound into the ordinary home.

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

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

How it works

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

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

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

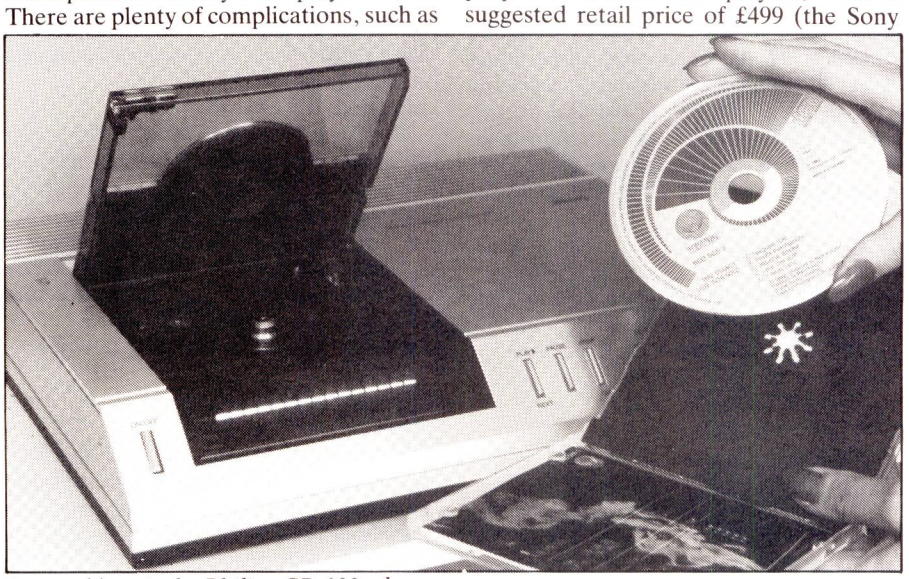
The digitised signal is stored and distributed on a 12cm diameter disc quite unlike the LP record. One side of it is covered by a label while the other, the playing side, has a silvery sheen. Although you can't see it, what you're looking at is in fact a spiral track of pits in a thin aluminium disc,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

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

In use

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

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



Pictured here is the Philips CD 100 player.

player in Tokyo was selling at about £330!).

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

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

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

I am convinced that the CD system will destroy the LP just as the LP did to the 78. If you think that £500 for a newfangled record deck on which you can't play your existing LPs is too much, well, my guess is that while there might be some cost-cutting in the Tottenham Court Road, the price will probably stay pretty much the same in figures, and the effect of inflation will be to make it cheaper in real terms – rather in the way that colour TV prices have behaved. The revolution won't happen overnight, either, but I would be prepared to bet that within five to seven years, we'll see a CD player in as many homes as now have colour TV sets. Which brings me on to the real reason for sneaking a piece of audio equipment into the pages of *PCW*.

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

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

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

NUMBERS COUNT

U-SEQUENCES

Mike Mudge muses mathematically.

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

This work is concerned with certain non-terminating (or infinite) sequences which will be written $\{u_r\}$ as 'short-hand' for u_1, u_2, u_3, ... The first two positive integers u_1 and u_2 will be given and the sequence is to be continued by including only those integers which can be expressed in just one way as the sum of two distinct earlier members of the sequence. Such a sequence is named a U-sequence after Stanislav M Ulam. Details will be given for the fundamental U-sequence defined by $u_1 = 1$ and $u_2 = 2$ although obvious generalisations are possible.

$\{u_r\}$ =
1,2,3,4,6,8,11,13,16,18,26,28,36,38,47,48,53 ...

$u_{100} = 690$, $u_{500} = 5685$, $u_{1000} = 12294$

Questions

Note: These are based upon the work of Bernardo Recamán, American Mathematical Monthly Vol 80 1973.

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

For the fundamental sequence

$u_1 + u_2 = 1 + 2 = 3 = u^3$

$u^{19} + u^{20} = 62 + 69 = 131 = u_{31}$

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

For the fundamental sequence these include 23,25,33,35,43,45,67,92,94,96.

(iii) Which pairs of consecutive integers are to be found in a given U-sequence?

For the fundamental sequence these include (1,2), (2,3), (3,4), & (47,48).

(iv) Are there arbitrarily large gaps between consecutive terms of a given U-sequence?

Problem

Submit a program which investigates some of the above questions for the U-sequence generated by a prescribed pair of positive integers u_1 and u_2.

In particular, verify the results of P Muller, MSc thesis, University of Buffalo 1966 that up to u_{20000} for the fundamental U-sequence the only four pairs of consecutive terms are those given in (iii) above but that over 60 per cent of consecutive terms differ by precisely 2. 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 August 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.

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



Lucky numbers winner

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

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

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

The 'best' entry has been chosen as that of K P Leary of 2 Grove Vale, Chiselhurst, Kent BR7 5DS, whose presentation deserves particular commendation both for its content and its appearance, attributed jointly to Tandy Scripsit software and an Anadex WP6000 printer in correspondence mode.

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

The prize-winning investigation provides further empirical evidence for the Goldbach-type conjecture relating to lucky numbers, also for distribution theorems analogous to those for primes relating both to luckies and twin luckies. At the time of writing, however, analytic proofs of these results seem as remote as they ever were.

SPECTRUM PLUS

Looking to enhance your Spectrum's capabilities? Steve Mann (with a little help from David Tebbut) could have the answer...

As a committed devotee of the easy life, I thought it was about time to take a look at some programming aids for the Spectrum. The only thing that links these somewhat disparate items of hardware and software is the fact that their use will make Basic programming easier/more productive/more fun...

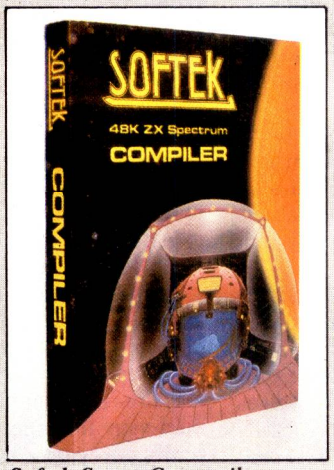
QUICK COMPILATION

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

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

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

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



Softek Super C compiler.

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

Super C does not handle either numeric or string inputs, but these can be simulated: for string inputs you have to set up a keyboard scanning routine which puts the ASCII codes of characters into high memory — these characters are then retrieved by the use of PRINT CHR$ PEEK. To deal with numeric inputs, an area of memory is allocated as a buffer to store the ASCII codes for the numerals. A checking routine is necessary to make sure that the codes are between 48 and 57 (the digits 0-9), and you also need a counter so that you will

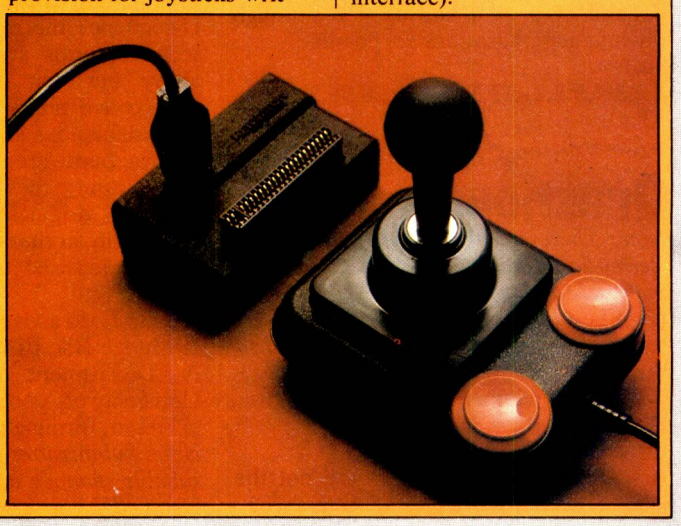
STICKING TO GAMES

A problem when playing games on a micro is the use of the keyboard to control movement, firing, etc. This is particularly noticeable in the case of the Spectrum, with its 'dead flesh' keys. So a joystick is an essential purchase. Clive unaccountably neglected to provide a joystick port on his machine, but this oversight has now been rectified by numerous manufacturers. Certainly not the cheapest on the market is Kempston's 'Competition-Pro' model, but it's robust enough to stand up to a good deal of hard and fast action.

A nice feature is the provision of two large firing buttons, making the stick suitable for both right and left handers.

There's not an awful lot you can say about joysticks — the action on this one seemed a little stiff and awkward at first but after a few games its use became second nature. It's sturdily constructed, has a comfortable grip and gives full eight-way directional action. A bonus is the fact that the connecting lead is five feet long — all too often this lead is far too short, resulting in the games-player having to sit uncomfortably close to the screen.

The Competition-Pro comes complete with a detachable interface box that plugs into the expansion port at the rear of the Spectrum. The joystick lead itself has a standard 'D' connector so, if the interface box is left off, the stick can be plugged into the Fuller Box. This is useful, as an important factor to consider is the number of software houses that have provision for joysticks written into their games. A large proportion of these are writing games for the Kempston stick; others are producing software for the Fuller Box. With the Kempston stick you have a choice — when used with the interface the stick is controlled with IN 31; when hooked up to the Fuller unit this changes to IN 127. Competition-Pro joystick — Kempston MicroElectronics, 180a Bedford Road, Kempston, Bedford MK42 8BL. £25 (includes interface).



Photography by Ian McKinnel

know how many digits are involved — this is important because you will need to multiply each number by the correct power of 10 to turn it into the full integer that you require. Thus, if the characters 5 and 7 have been entered, you multiply 5 by 10 and add it to 7 to give the correct number.

Super C runs on the 48k Spectrum only, and is very wasteful of memory. The compiler itself takes up the space between 32767 and 54000, and compiled code sits in the Basic program area between the system variables and the compiler. The area above 54000, therefore, is usable only for storage of data and graphics. There are other limitations — FOR...NEXT loops must step exactly to the defined limits: FOR A = 1 TO 11 STEP 2 will work fine, but FOR A = 1 TO 11 STEP 3 will go into an infinite loop. GOTOs and GOSUBs must jump to a line number that exists — unlike normal Spectrum usage the program won't continue from the next line. All equations are calculated in strict left-to-right order, with brackets ignored. The RESTORE command is also limited — RESTORE refers back to the start of DATA items; it is not allowed to have a program line like RESTORE 100. PAUSE 0 will usually halt programs until a key is pressed; this does not work on Super C. IF...THEN statements must end with GOTO or GOSUB.

Numeric and string arrays are dealt with in a very cumbersome manner: the method suggested for numeric arrays is to set aside a known and restricted block of memory in the area from 54000 upwards. You then, in effect, create a variable area there by POKEing the values of the array into successive memory locations. Thus an array of 10 elements could be set up in locations 54000 to 54009 with the first element in 54000, the second in 54001, etc. This is equivalent to A(1), A(2) and so on.

String arrays are similar, but are set up by using ASCII codes for the characters. In both case the array elements are retrieved by using PEEK.

A plus point for Super C is the fact that, once compiled with RANDOMIZE 49152, programs are executed with the normal Basic RUN command — there is no need to

SOUND SOLUTION

A major drawback for the Spectrum user is the machine's weedy sound facilities — the BEEP command is limited and the volume pathetic. The rival Oric's sound capabilities put the Spectrum to shame. A host of hardware add-ons have been produced by various firms to boost the Spectrum's feeble BEEPs; these include devices that route the sound through the TV set and small plug-in amplifiers that double as transistor radios.

Fuller Micro Systems has now come up with what must be the state of the art in Spectrum sound systems.

Of modular design, at its simplest it consists of a straightforward BEEP amplifier. The 'Fuller Box' adds a programmable sound generator, and there is also the 'Fuller Orator' speech synthesis unit. The 'Master Unit' brings all these together in a single box.

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

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

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

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

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

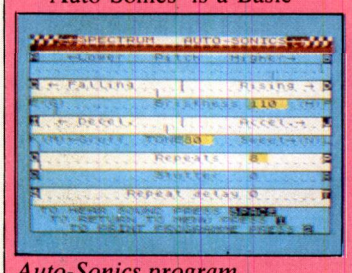
Sound amplifier box	£6.95
Fuller Box	£29.95
Orator + Box	£39.95
Orator upgrade (to fit in Box)	100£24.95
Master Unit	£54.95

(Available from Fuller Micro Systems, The ZX Centre, Sweeting Street, Liverpool 2.



For those who don't wish/can't afford to expand their Spectrum's sound but simply want to make the best of the existing facilities, a piece of software from Buttercraft should be just the job.

'Auto-Sonics' is a Basic program that, simply and with the minimun of fuss, allows a whole range of sounds to be incorporated in Basic programs.



Auto-Sonics program.

On loading the cassette a menu of 26 pre-defined sounds appears. These encompass telephone, siren, machine gun, helicopter, space game noises, outboard motor, frog, train, etc — some of the descriptions could charitably be termed 'loose', others are more accurate, but they are all easily modified. First choose the sound you want to work on, then press '1'. The display changes to a set of 'slider controls' which can easily be manipulated until the desired effect is achieved. When this is done, simply press '2' — you are now faced with a program line that will exactly reproduce the desired effect when incorporated in a program. Ingenious and well designed — and the effects when put through an amplifier like the Fuller Bos are excellent.

Auto-Sonics — Buttercraft Software, 14 Western Avenue, Riddlesden, Keighley, Yorks. £4.95.

SPECTRUM PLUS

work out the starting address for use with USR. Also very handy are the Super C REMs — REM B checks for the BREAK key being pressed; REM M allows you to insert a machine code routine into the Basic you are compiling; and REM N gives a total NEW, with program and compiler being wiped from memory. NEW itself clears the program only and leaves the compiler intact.

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

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



Wye Valley Software compiler.

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

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

Variable names may consist of upper and lower case letters plus numbers — so you could have variables A, a, A1 and a1. Numeric inputs are handled in normal Spectrum fashion, and in general there are less restrictions on the user with M-Coder than with Super C. Arbitrary expressions are accepted quite happily, with the proviso that they are enclosed in brackets in LET statements. GOTOs and GOSUBs will jump to the next line number if the one stipulated does not exist, and PAUSE 0 has its normal effect of stopping program

EASY GRAPHICS

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

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

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

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

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

Save: saves current display on tape.

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

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

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

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

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

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

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

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

With the help of this package, you should be able to design your own displays and characters with the minimum of effort. It's very easy to use and the documentation is clear and concise.

Spectrographics — Bridge Software, 36 Fernwood, Marple Bridge, Stockport, Cheshire. £7.50.

Just before the final deadline for this piece I received a pre-production copy of Micro's new graphics design package. The version I have seen is a demonstration only and included no documentation. Obviously designed with the games-player in mind, the package concentrates on fast-moving graphics and gives routines for rotating shapes.

Microl's Use and Learn package was an extremely good tuition package that was aimed at helping the beginner make the most of the Spectrum's capabilities. This is to the same high standard and is well worth keeping an eye open for. Microl — 12 Pheasant Close Purley, Surrey.



Special effects using Bridge Software's Spectrographics.

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

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

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

To run a compiled program, simply note the start address, then type 'RAND USR start address'. Programs may be stacked by moving RAMTOP.

The range of command handled is very similar to that of M-Coder. Calculations must be enclosed in brackets, STEPs are dealt with in normal Basic manner, and GOTO/GOSUB/RESTORE follow usual Basic style. Numeric inputs are totally straightforward and have the advantage of optionally appearing in the top portion of the screen.

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

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

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

Super C — Softek, 329 Croxted Road, London SE24. £14.95.
M-Coder — Personal Software Services, 452 Stoney Stanton Road, Coventry CV6 5DG. £8.95.
Wye Valley — Martin Lewis, Tarton House, Kinnersley, Hereford. £7.99.

THE SYSTEMATIC APPROACH

As I mentioned in the review of compilers, Super C is part of a whole set of Spectrum utilities from Softek, marketed under the name 'SofSys'. This system has several interesting features and merits closer examination.

At the heart of SofSys is Softime — the master key program. This comes on a cassette containing four versions — one for the 16k Spectrum and three for the 48k model. These three are

GOTO page 237

TESTING TIME

Are you a machine code freak or would you like to become one? If the answer to either question is 'yes' then you might be interested in this package. It was originally produced to help Francis Ainley write machine code programs for the Sinclair machines. After a while he realised that it could be just what the world was waiting for, so his company has published it along with a useful character generator program which is supplied 'free' on the same cassette.

There's no doubt that experienced machine code hackers will find this a useful addition to their range of software tools if they haven't already got the means of entering, amending and testing machine code programs. For someone who doesn't know machine code from the back end of a bus, it would be useful only if they plan to master this obscure form of programming. For those teetering on the brink, I say 'have a go'. If you're anything like me, you'll find it the most time-consuming but satisfying way of writing computer programs.

Right, what does the MCTT (Machine Code Test Tool) do for you? First, it introduces you to some very basic principles of machine code programming through its worked examples. Francis tells me he had far more problems writing the 32-page booklet than he did with writing the program and I can believe it because he has managed to pack a lot of information into this very slim volume. The program itself allows you to enter information, move chunks of memory around, isolate and run bits of program and examine memory and CPU registers. It also has a handy hexadecimal/decimal conversion routine which you can use on the fly, so to speak.

Taking the manual in sequence, you first encounter the hex/dec routines. After a clear explanation of hexadecimal notation you are introduced to a couple of examples which show you how the routines work. Simply enter something like D00200 to obtain the reply 'D00200=H00C8' or, going the other way, H1000 produces 'H1000-D04096'. The booklet then goes on to explain how a computer works, covering basic principles such as memory, the program counter, registers and instructions. It does not attempt to teach you machine code programming. For that you will need an appropriate tutorial book.

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

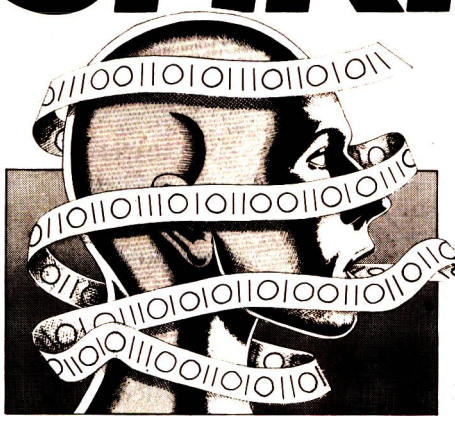
The only other commands are Move (M), which lets you shift blocks of memory around; Page Memory (P), which shows you any contiguous 30 bytes of memory; Nullify Last Breakpoint (N), which 'undoes' the last breakpoint and Stop (S) which returns you to Basic.

Everything worked well and during the test, I didn't crash it once. The commands are easy to use and the booklet is very clear. It does contain a couple of small errors but, unless you're a complete nerd, they are pretty obvious and shouldn't hold you up.

I figured that a price between five and ten pounds would be appropriate. I then learned that it had been pitched at £9.95. I suppose that when you consider the 'free' character generator, this represents fair value for money. MCTT runs on both 16k and 48k Spectrums and is obtainable from Oxford Computer Publishing Ltd or larger branches of W H Smith.

David Tebbutt

SHRINK RAPT



PSYCHOANALYSIS USING LISP

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

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

How do you do. Please tell me your problem
My relations are all alike
In what way?
They're always getting at me about something or other
What incident are you thinking of?
Well, my mother made me come here
Who else in your family made you come here?
No one
Tell me more about your mother
She treats me like a child
What exactly do you mean?
etc

The Lisp program presented here is a simplified version of the original Eliza which was developed by Joseph Weizenbaum in 1966, and which has since become well known as an example of computer 'intelligence'. The program's name derives from the character in Bernard Shaw's Pygmalion conversation. This version will run on a fairly small Lisp system and should act as an amusing demonstration of Artificial Intelligence. Although not intended as a serious clinical tool, the program nevertheless demonstrates a possible application of computers in medicine; indeed, patients appear to prefer to communicate with a computer than with a human doctor when they are being asked simple diagnostic questions.

The Eliza program works by 'pattern matching', using Lisp lists to represent the sentences being manipulated. First the program looks for certain keywords in the sentence that the user types in; it then tries to match certain patterns of sentences which contain that keyword. The main function used by Eliza to perform this pattern-matching is called MATCH. The first argument to MATCH is a 'pattern' which is compared with the sentence that has been typed in. The second argument is the 'data'; ie, the actual sentence.

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

(MATCH '(ONE TWO) '(ONE TWO))
= T
(MATCH '(ONE TWO)
'(ONE THREE))= NIL

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

★ matches any sequence of words, and

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

Thus: (MATCH '(ONE ★ TWO) '(ONE THREE FOUR TWO)) = T
(MATCH '(ONE = R) '(ONE TWO THREE)) = T and R = (TWO THREE)

? matches any single word.

Thus: (MATCH '(ONE ?) '(ONE TWO))
= T

(...) Q (where (...) represents a list) matches any of the alternatives in the list (...) and assigns the matching word to Q.

@ Q evaluates Q and replaces it by its value.

Thus: (SETQ LI '(ALPHA BETA GAMMA))
(MATCH 'ONE @ LI Q) '(ONE BETA)) = T and Q = (BETA).

The full definition of MATCH is shown in Fig 1. It is a function of two arguments, P the pattern, and D the data. Its operation is as follows: First, a null pattern always matches null data. Otherwise, set the local variable CP to the first item in the pattern and test for other possibilities. If there is no

```
(DEFUN MATCH (P D (CP))
   (COND
      ((NULL P) (NULL D))
      (T (SETQ CP (CAR P))
         (COND
            ((NULL D)
               (COND
                  ((EQ CP '*) (NULL (CDR P)))
                  ((AND
                     (EQ CP '=)
                     (NULL (CDDR P)))
                     (SET (CADR P) NIL)
                     T)))
            ((LISTP CP)
               (COND
                  ((MATCH
                     (CONS (CAAR P) (CDDR P))
                     D)
                     (SET (CADR P) (CAR D))
                     T)
                  ((MATCH
                     (CONS (CDAR P) (CDR P))
                     D)
                     T)))
            ((EQ CP '@)
               (MATCH
                  (CONS
                     (EVAL (CADR P))
                     (CDDR P))
                  D))
            ((OR (EQ CP '?) (EQ CP (CAR D)))
               (MATCH (CDR P) (CDR D)))
            ((EQ CP '*)
               (OR
                  (MATCH (CDR P) D)
                  (MATCH P (CDR D))))
            ((EQ CP '=)
               (COND
                  ((MATCH (CDDR P) D)
                     (SET (CADR P) NIL)
                     T)
                  ((MATCH P (CDR D))
                     (SET
                        (CADR P)
                        (CONS
                           (CAR D)
                           (EVAL (CADR P))))
                     T)))))))
```

Fig 1

```
(DEFUN GETSEN ((L) (M) (J) (K))
   (LOOP (UNTIL (SETQ K (EXPLODE (READLINE))))
   (LOOP
      (UNTIL (NULL K) J)
      (SETQ L NIL)
      (LOOP
         (SETQ M (CAR K))
         (SETQ K (CDR K))
         (UNTIL (EQ M BLANK))
         (SETQ L (APPEND L (LIST M)))
         (UNTIL (NULL K)))
      (SETQ J (APPEND J (LIST (IMPLODE L))))))
```

Fig 2

```
(DEFUN APPEND
   (HEAD TAIL)
   (COND
      ((NULL HEAD) TAIL)
      (T (CONS (CAR HEAD) (APPEND (CDR HEAD)
                                  TAIL)))))
```

Fig 3

```
(DEFUN PRL (L)
   (COND
      ((NULL L) NIL)
      ((ATOM L)
         (SETQ LEFT
            (DIFFERENCE LEFT (ADD1 (CHARS L))))
         (COND
            ((GREATERP 1 LEFT)
               (SETQ LEFT 35)
               (PRINT)))
         (PRINC L BLANK))
      ((EQ (CAR L) '=)
         (PRL (EVAL (CADR L)))
         (PRL (CDDR L)))
      ((EQ (CAR L) '£)
         (PRL (EVAL (CADR L)))
         (SET (CADR L) NIL)
         (PRL (CDDR L)))
      (T (PRL (CAR L)) (PRL (CDR L)))))
```

Fig 4

```
(DEFUN LOOKUP (S (J))
   (COND
      ((NULL S) NIL)
      ((NUMBERP S) S)
      ((ATOM S)
         (SETQ J (EVAL S))
         (COND
            ((EQ UNDEFINED J) S)
            ((OR (SUBRP J) (FSUBRP J)) S)
            ((NULL J) S)
            ((ATOM J) J)
            ((NUMBERP (CAR J)) (FIND J) S)
            (T (FIND (CDR J)) (CAR J))))
      (T (CONS
            (LOOKUP (CAR S))
            (LOOKUP (CDR S))))))
```

Fig 5

```
(DEFUN FIND (P (J))
   (COND
      ((AND
         (NUMBERP (CAR P))
         (GREATERP (CAR P) MAX))
         (SETQ MAX (CAR P))
         (SETQ RMAX (CDR P))
         NIL)))
```

Fig 6

more data (NULL D), only match it if the pattern is '★', or '=' followed by a variable. If the first item of the pattern is '@', replace it by the next item's value. If the first item of the pattern is the same as the first item of the data, or a '?', they match, so call MATCH recursively for the ramainder of the pattern and data. If the pattern begins with '★' it matches anything. Finally, if the pattern begins with '=' it matches anything, and assigns the matching words to the following variable.

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

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

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

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

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

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

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

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

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

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

Database format

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

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

The format for each database entry is:
(replacement value ((pattern) (match) (pattern) (match))
Thus, the entry for AM in the database is:

```
(SETQ AM
   '(ARE O
      ((★ ARE YOU = R))
            (DO YOU BELIEVE YOU
ARE = R))
      ((★) (I DON'T UNDERSTAND
THAT)))
```

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

AM I GOING MAD
this would first be converted into
ARE YOU GOING MAD
(because each occurrence of I is also converted into YOU), and this would then match the first pattern:
(★ ARE YOU = R)
giving the value (GOING MAD) to R, and the reply:
DO YOU BELIEVE YOU ARE GOING MAD
would be given. The second pattern (★) will match any input sentence and result in the catch-all reply 'I DON'T UNDERSTAND THAT'.

Thus, the Eliza program is to perform the following steps:

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

The first operation is performed by the function LOOKUP, shown in Fig 5. It looks up each word in the input sentence, and, if found in the database, it calls another function, FIND.
FIND, shown in Fig 6, takes the database entry of a word and tests its value against MAX, which contains the value of the best word so far found. If greater than MAX, RMAX is set to the list of patterns and matches for that word.

If no match is found, the function FLANNEL is called which gives a non-commital reply, or harks back to a subject mentioned at an earlier time; see Fig 7. Calling FLANNEL more than five times terminates the interview with the message 'SORRY YOUR TIME IS UP'! The global variables/FAMILY, /MEMORY, /

```
(DEFUN ELIZA ((/FAMILY)
      (/MEMORY)
      (/WISH)
      (/DESIRE)
      (/HAPPY)
      (/SAD)
      (/STOP)
      (/VICE)
      (FN.0)
      (LEFT.0))
   (PRL
      '(HOW DO YOU DO!. PLEASE TELL ME
                              YOUR PROBLEM))
   (PRINT)
   (LOOP
      (UNTIL /STOP 'BYE)
      (SETQ RMAX ZILCH)
      (SETQ MAX -1)
      (PRINT)
      (SETQ S (LOOKUP (GETSEN)))
      (SETQ LEFT 40)
      (PRINT)
      (PRL
         (LOOP
            (WHILE RMAX (FLANNEL))
            (UNTIL
               (MATCH (CAAR RMAX) S)
               (CDAR RMAX))
            (SETQ RMAX (CDR RMAX))))
      (PRINT)))
```

Fig 8

```
(DEFUN FLANNEL NIL
   (COND
   (/FAMILY
   '(TELL ME MORE ABOUT YOUR £ /FAMILY))
   (/MEMORY
   '(DOES THAT HAVE ANYTHING TO DO WITH THE FACT THAT YOUR £ /MEMORY ?))
   (/DESIRE
   '(PERHAPS WE SHOULD CONSIDER WHAT WOULD ENABLE YOU TO = /DESIRE))
   (/WISH
   '(WHY DON!'T YOU TELL ME WHAT YOU WOULD DO IF £ /WISH))
   ((AND /SAD /VICE)
   '(PERHAPS YOU WOULD FEEL £ /SAD LESS IF YOU WERE ABLE TO £ /VICE))
   (/SAD
   '(TELL ME MORE ABOUT WHEN YOU FEEL £ /SAD))
   (/HAPPY
   '(DOES THIS AFFECT WHETHER YOU FEEL £ /HAPPY ?))
   (/VICE
   '(WHAT DO YOU THINK WOULD HELP YOU TO £ /VICE ?))
   (T (SETQ FN (ADD1 FN))
      (COND
         ((EQ FN 1)
            '(WHAT EXACTLY DO YOU MEAN ?))
         ((EQ FN 2) '(TELL ME MORE))
         ((EQ FN 3)
            '(HOW DOES ALL THIS RELATE TO YOUR TROUBLES))
         ((EQ FN 4)
            '(PERHAPS YOU SHOULD TAKE LIFE LESS SERIOUSLY))
         ((EQ FN 5)
            (SETQ /STOP T)
            '(SORRY YOUR TIME IS UP!.))))))
```

Fig 7

DESIRE, /WISH, /VICE, etc are set to a non-NIL value if the user has mentioned a particular subject.
Finally, the main routine that runs the ELIZA program is called ELIZA and is shown in Fig 8.

The Eliza database

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

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

```
(DEFUN DEF X (SET (CARX) (CADR X)))
```

Entries in the database have three formats:

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

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

Postscripts

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

Finally, a more adventurous project might be to make Eliza learn from its encounters with humans, so that the database of keywords would be expanded as more people used it.

END

```
    ((* YOUR * @ MFBS /FAMILY = Q) (WHO ELSE IN YOUR FAMILY = Q ?))
    ((* YOU @ FEEL Q * YOUR = /MEMORY) (WHY DO YOU SAY YOUR = /MEMORY ?))
    ((* YOU = R YOUR = Q) (WHY DO YOU = R YOUR = Q ?))
    ((* YOUR = /MEMORY)
       (WHY DOES IT MATTER TO YOU THAT YOUR = /MEMORY ?)))
    ((= R)
       (WHY DOES IT MATTER TO YOU THAT = R ?)))

(DEF ALWAYS (1
   ((*) (WHAT INCIDENT ARE YOU THINKING OF ?))))

(DEF GOODBYE (9
   ((= /STOP) (DO COME AGAIN))))

(DEF NOONE (2
   ((* (NOBODY NOONE) Q = R)
      (SURELY YOU CAN THINK OF SOMEBODY WHO = R ?))))

(SETQ NO-ONE NOONE)

(SETQ NOBODY NOONE)

(DEF EVERYBODY (2
   ((* (EVERYONE EVERYBODY) Q *)
      (CAN YOU THINK OF ANYONE IN PARTICULAR ?))))

(SETQ EVERYONE EVERYBODY)

(DEF BECAUSE (0
   ((* BECAUSE YOU ARE = Q) (WHO ELSE SAYS YOU ARE = Q ?))
   ((* BECAUSE YOU = Q) (DO YOU = Q FOR ANY PARTICULAR REASON ?))
   ((*) (IS THAT THE ONLY REASON ?))))

(DEF LIKE (10
   ((* (AM IS ARE WAS) Q * (LIKE LOVE) Q *)
      (WHAT DO YOU SUPPOSE THAT RESEMBLENCE MEANS ?))
   ((* YOU WOULD * (LIKE LOVE) Q TO = /DESIRE)
      (WHY WOULD YOU = Q TO DO THAT ?))))

(SETQ LOVE LIKE)

(DEF YOU!'RE (I'M 0
   ((* I'M = R) (PERHAPS YOU WOULD LIKE TO BE = R ?))))

(DEF BELIEF WISH)

(SETQ MFBS '(MOTHER FATHER BROTHER SISTER))

(DEF MYSELF YOURSELF)

(DEF YOURSELF MYSELF)

(DEF ARE (0
   ((* ARE I = R) (WOULD YOU PREFER IF I WEREN'T = R ?))
   ((* ARE = R) (POSSIBLY THEY ARE = R))))

(DEF AM (ARE 0
   ((* ARE YOU = R) (DO YOU BELIEVE YOU ARE = R))
   ((*) (I DON'T UNDERSTAND THAT))))

(DEF MACHINE (50
   ((*) (WHY DO COMPUTERS WORRY YOU ?))))

(SETQ MACHINES MACHINE)

(SETQ COMPUTERS MACHINE)

(SETQ COMPUTER MACHINE)

(DEF HELLO (0
   ((*) (HOW DO YOU DO!. PLEASE TELL ME YOUR PROBLEM))))

(DEF I!'M (YOU!'RE 0
   ((* YOU'RE * (SAD UNHAPPY DEPRESSED SICK) /SAD *)
      (CAN YOU EXPLAIN WHAT MADE YOU = /SAD ?))
   ((* YOU'RE * (HAPPY ELATED GLAD BETTER) /HAPPY *)
      (WHAT MAKES YOU = HAPPY JUST NOW ?))
   ((* YOU'RE = Q) (DO YOU ENJOY BEING = Q ?))))

(DEF NAME (15
   ((* YOUR NAME IS = R) (PLEASED TO MEET YOU = R !. MY NAME IS ELIZA))
   ((*) (I'M NOT INTERESTED IN NAMES))))

(DEF MAYBE (0
   ((*) (YOU DON'T SEEM QUITE CERTAIN))))

(SETQ PERHAPS MAYBE)

(DEF ALIKE (10
   ((*) (IN WHAT WAY ?))))
```

Fig 8

```
(SETQ SAME ALIKE)

(DEF CAN (0
   ((* CAN I = R) (PERHAPS YOU WOULD LIKE TO BE ABLE TO = R YOURSELF ?))
   ((* CAN YOU = R) (DO YOU WANT TO BE ABLE TO = R ?))
   ((*) (WHAT ?))))

(DEF DREAMS (4
   ((= DREAM) (CAN YOU DESCRIBE ONE ?))))

(DEF DREAMED (DREAMT 4
   ((* YOU DREAMT = DREAM) (HAVE YOU DREAMT = DREAM BEFORE ?))))

(SETQ DREAMT DREAMED)

(DEF I (YOU 0
   ((* YOU (WANT NEED) Q = R)
      (WHAT WOULD IT MEAN TO YOU IF YOU GOT = R))
   ((* YOU ARE * (SAD UNHAPPY DEPRESSED SICK) /SAD *)
      (I'M SORRY TO HEAR YOU ARE = /SAD))
   ((* YOU ARE (HAPPY ELATED GLAD BETTER) /HAPPY *)
      (HOW HAVE I HELPED YOU TO BE = /HAPPY ?))
   ((* YOU @ FEEL BELIEF YOU = R) (DO YOU REALLY DOUBT YOU = R ?))
   ((* YOU @ FEEL BELIEF * I ARE = R) (WHAT MAKES YOU THINK I'M = R ?))
   ((* YOU @ FEEL BELIEF * I = R) (WHY DO YOU WANT ME TO = R ?))
   ((* YOU ARE = Q) (HOW LONG HAVE YOU BEEN = Q ?))
   ((* YOU (CAN'T CANNOT) Q = /VICE)
      (HOW DO YOU KNOW YOU CAN'T = /VICE ?))
   ((* YOU DON'T = R) (WHY DON'T YOU = R ?))
   ((* YOU FEEL *) (TELL ME MORE ABOUT SUCH FEELINGS))
   ((* YOU = R I *) (PERHAPS IN YOUR FANTASY WE = R EACH OTHER))
   ((WELL = R) (DO YOU SAY = R FOR SOME SPECIAL REASON ?))
   ((= R) (YOU SAY = R ?))))

(DEF REMEMBER (5

   ((* YOU REMEMBER = R)
      (DOES THINKING OF = R BRING ANYTHING ELSE TO MIND ?))
   ((* DO I REMEMBER = R) (DID YOU THINK I WOULD FORGET = R ?))
   ((*) (GO ON !.!.!.))))

(DEF WHEN (0
   ((*) (WHY DO YOU ASK ?))))

(SETQ FEEL '(FEEL THINK BELIEVE WISH))

(DEF WHY (0
   ((* WHY DON'T I = R) (PERHAPS I WILL = R IN GOOD TIME))
   ((* WHY CAN'T YOU = /VICE)
      (HAVE YOU ANY IDEA WHY YOU CAN'T = /VICE ?))
   ((*) (PERHAPS YOU SHOULDN'T ASK))))

(DEF YOUR (MY 0
   ((* MY = R) (WHAT ABOUT YOUR OWN = R ?))))

(DEF ME YOU)

(DEF WHAT (0 ((*) (WHY DO YOU ASK ?))))

(SETQ HOW WHAT)

(DEF WERE (WAS 2
   ((* WAS YOU = R) (WHAT IF YOU WERE = R ?))
   ((* YOU WAS = R) (WHY DO YOU TELL ME YOU WERE = R NOW ?))
   ((* WAS I = R) (WHAT SUGGESTS THAT I WAS = R ?))
   ((*) (CAN YOU EXPLAIN ?))))

(SETQ WAS WERE)

(DEF IF (3
   ((* IF * (WERE WAS) *) (HOW WOULD THAT HELP ?))
   ((* IF ONLY = /WISH) (WHAT WOULD YOU DO IF = /WISH ?))
   ((* (IF = /WISH) (DO YOU THINK IT'S LIKELY THAT = /WISH ?)))))

(DEF YOU (I 0
   ((* I * (FOOL TWIT IDIOT BERK) Q *) (PERHAPS YOU ARE THE = Q))
   ((* I ARE = R) (WHAT MAKES YOU THINK I AM = R ?))
   ((* I = R YOU) (WHY DO YOU THINK I = R YOU ?))
   ((*) (WE WERE DISCUSSING YOU - NOT ME))))

(DEF SORRY (0
   ((*) (PLEASE DON'T APOLOGISE))))

(DEF BYE (9 ((= /STOP) (DO COME AGAIN))))

(DEF ZILCH
   (((* (PISS BUZZ) Q OFF *) (WHY DON'T YOU JUST SAY GOODBYE ?))))
```

Fig 9

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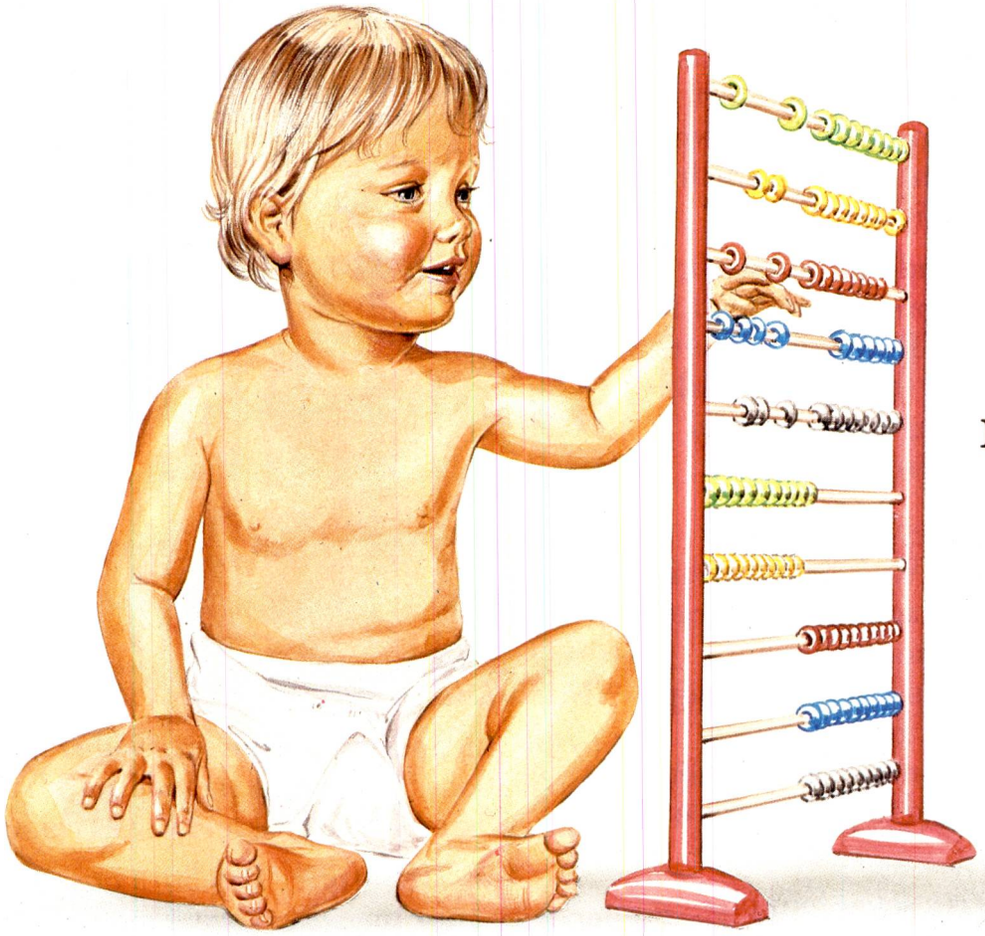

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SIRIUS 1

SHARP A/B

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☐ EPSON HX-20	☐	☐ DAISY	

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.....

POST CODE .....

For the best hardware, the best software.

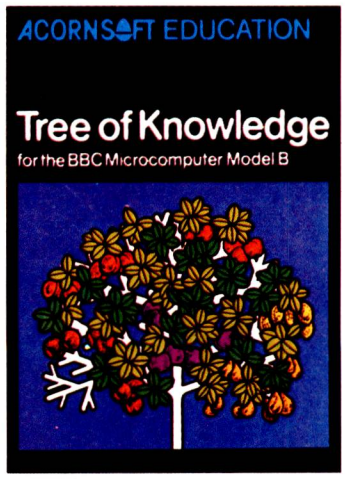
The BBC Microcomputer system is generally regarded to be the best micro in its price range you can lay your hands on. So, if you're thinking of buying one or already own one, you'll want to know about the software that's been specially designed for it.

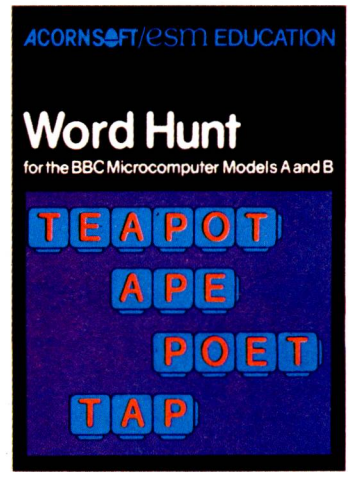
Not surprisingly, it's made by Acornsoft, the software division of Acorn Computers Ltd., who designed and built the BBC Microcomputer. So naturally you can expect the highest quality software with the built-in ingenuity to fully exploit the BBC Micro's potential.

Further education for everyone.

Tree of Knowledge (£9.95) is an interactive program for children of all ages teaching categorisation. It illustrates some of the more practical aspects of computing in that the pupil first educates the computer, building up a database by answering the computer's questions, and the database is then used to play games of deduction and logic.

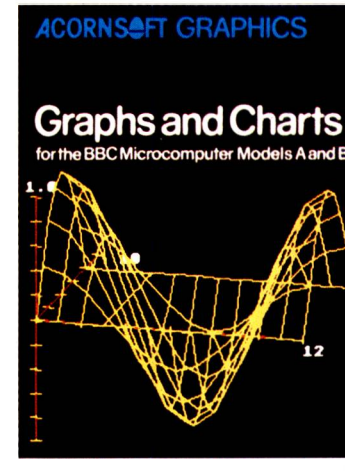
Word Hunt (£11.90) is a set of four programs, each containing a list of nine words. The object of the exercise is to select one word and then try to create as many smaller words as possible from the selected word.

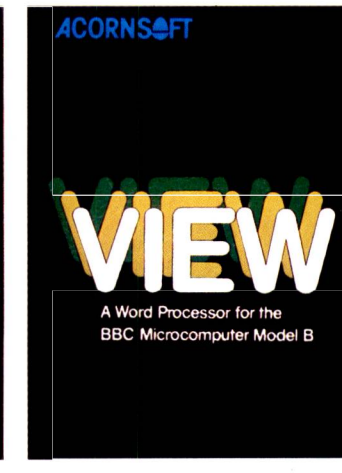




Increase your business acumen.

Graphs and Charts (price £17.45) which includes the book 'Graphs and Charts on the BBC Microcomputer' contains a set of programs to present data graphically in a wide range of applications. The graphs include automatic scaling, labelling of axes and use of colours.

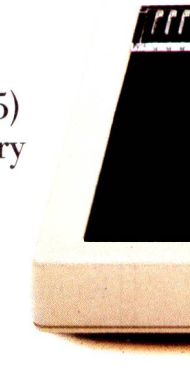


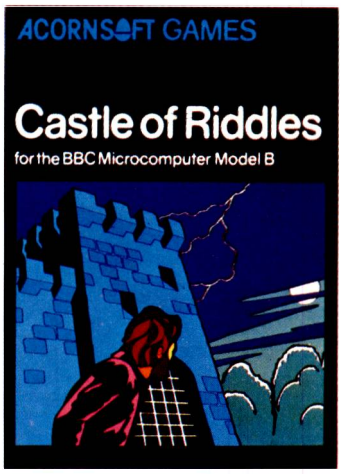


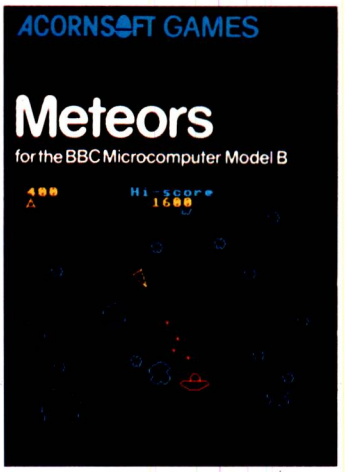
And VIEW (price £59.80) a program that enables your machine, together with a printer, to operate as a fully operational word processor. For convenience the program is in ROM so that it can become a permanent feature of your machine. (It can easily be fitted by your local dealer). You'll find out more by going to your dealer or by sending for the free catalogue.

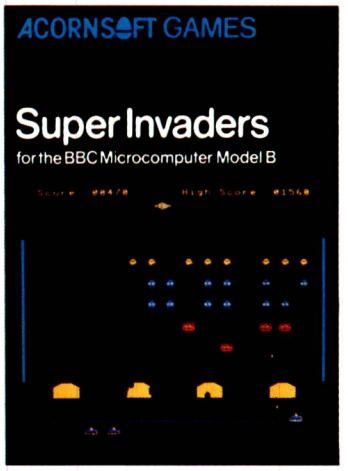
Mind-boggling games.

Castle of Riddles (price £9.95) is a magical adventure, with wizardry and hocus pocus of all kinds; booby traps and fiendish riddles to be unravelled along the tortuous route to the Magic Ring of Power. Your reward is to keep the









treasure you find along the way.

Meteors (price £9.95) is a game where you have to manoeuvre your laser-ship through a hail of meteors, smashing them with your laser bolts as they hurtle towards you on all sides. Complete with sound effects and table of Hi-Scores.

Super Invaders (price £9.95) is a fight against invading aliens. The only way to resist and avoid subsequent annihilation is to destroy the aliens before they land. You have three mobile launchers whose hyper-velocity missiles will instantly vaporise their target on impact. This game includes high-score, and is fully compatible with either keyboard or joysticks.

Understanding computers.

Peeko-Computer (price £9.95) simulates the operation of a simplified microcomputer in order to teach the fundamentals of machine-code programming. It comes complete with a 16 page instruction manual including exercises and examples, and the cassette features five demonstration Peeko-Computer programs.



How to get Acornsoft programs.

If you're a credit card holder and would like to buy cassettes of the programs shown in this advertisement, or if you would like to know the address of your nearest stockist, just phone 01-200 0200.

Alternatively, you can buy the cassettes directly by sending off the order form below to: Acornsoft, c/o Vector Marketing, Denington Estate, Wellingborough, Northants NN8 2RL.

Also use this form if you would like to receive the current free Acornsoft catalogue.

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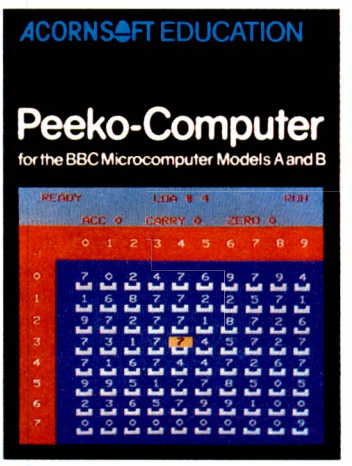

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SOFTWARE
DATABASE BENCHTEST

Kathy Lang examines a complex, new data management package which makes excellent use of the Sirius' special features under MS-DOS.

TOMORROW'S OFFICE ON THE SIRIUS TODAY?

Tomorrow's Office is a data management package especially supplied for the Sirius: it uses the capabilities of the screen to show an attractive face to the user, and it uses the function keys to make the package easier to use. The approach is clear from the beginning — a picture of the 'Welcome' screen is shown as Fig 1. The functions it provides cover pretty well the full range I've come to expect in fully-fledged micro data management packages for Z80 and 8086/8-base machines. The package runs under MS-DOS. It allows the user to set up a master file for a particular application, and a related transaction file, with the same key but with perhaps many transactions for each master record. For many applications, only a master file would be required. But for some people, the master/transaction approach could be very useful; for instance, a doctor could keep the overall information about patients, such as date of birth, NHS number, address, etc on the master file, and then keep one transaction record for each separate illness suffered by the patient. Throughout, you can usually assume that similar facilities are provided for master and for transaction records, though there are some limitations; for instance, you can't create a transaction record for which no master record exists.

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

Constraints

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

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

File creation and indexing

To create a data file, you must first set up a master format of the data. This is kept in a separate file. The process of setting up a format is a combination of 'paint-a-screen' and response to prompts. For each field in the record, you position the cursor at the position where you want the field title to begin, press the ESCape key, and then reply to the prompts in the bottom part of the screen about content of title, type and length of field, and so on. (You can choose to define start of field position by row and column numbers instead, if you really want to.) Fields may not span more than one line, but the associated title can be on the line above, to permit titles for maximum-length fields. Fields can be defined as depending on the values of other fields, to be replaced by the result of the calculation at input or amendment of the record, but the exact definition of the calculations is given

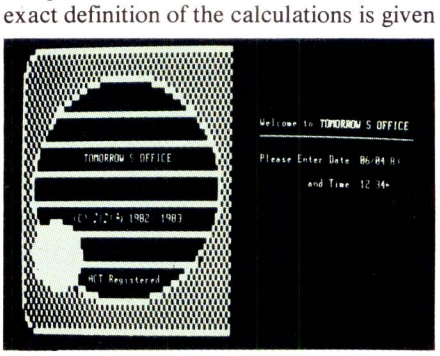

Fig 1

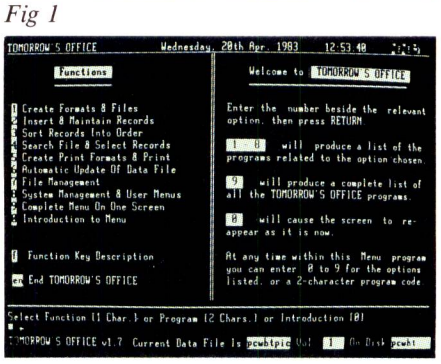

Fig 2

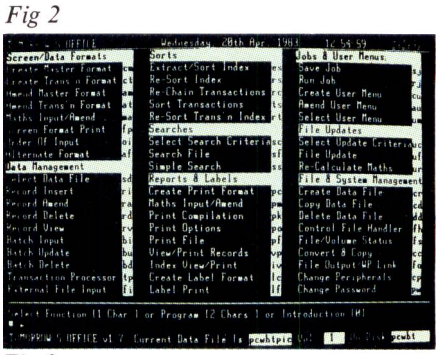

Fig 3

separately — see my section on 'Calculation'. Where a transaction file is associated with the master file, you must allow sufficient space below the master format to display the transaction format simultaneously. Once created, you can ask for a print of the format in a form which gives lengths of fields and other useful information — the printout for my Benchtest records is shown in Fig 5.

I have mixed feelings about the use of 'question-and-answer' for defining a format — personally, I think it's easier to have a completely 'paint-a-screen' approach, with 'help' information on the bottom of the screen, so that you can see immediately the effect of what you're doing. But the formatting was quite easy and flexible to use, so it's not a serious disadvantage. One feature I particularly liked was the ease with which one could say 'I'd like another field just like this one' in a particular position (marked with ESC as usual), and then change just the title of the new field, rather than having to define separately several fields with identical formats.

Each file must have a single alphanumeric key field, which may be defined as containing unique values or permit duplicates. If the key field must be unique, Tomorrow's Office will reject records with keys which duplicate an existing key. This main key is used for all access for file maintenance — insertion, amendment, deletion. Indexes may be created based upon the values of other fields; these indexes can then be used to display or print records in a particular order. You can also select records according to specified criteria without re-ordering them in any particular way — see under 'Selection'. But the accent in the package is clearly on accessing individual records quickly by using the key field.

In addition to the master format, each file may also have up to 15 alternate formats. These are created in a similar way, but can be used only to display individual records, not amend or delete them. So if you wanted to keep some information confidential, but permit general access to other information so that, for instance, clerical staff could update public information such as addresses, you would have to divide the record into a master and a transaction part, with one transaction per master, and permit general access only to the transaction part.

Max no. data files on one disk	15
Max file size	30,000 master records, 60,000 transactions. Not limited to one disk.
Max no. records	As file size.
Max size record	484 characters — master file only used. 240 characters master, 244 transaction where both used.
Max no. fields	60 — master file only used 60 each, 90 total if master & transaction used.
Max field size	78 characters 11 digits including sign — 5 decimal places
Max no. index files	15 per master data file
Max length sort fields	128 characters in max 3 fields
Calculation limits	10 operations per field, 100 per record
Field types	character, numeric, date(day/month/year-8chars)

Fig 4 Constraints

FLD	LINE	COL	TYPE	TITLE	LEN	DIS	RVS	POS
1	1	3	Key	Refnum	5	Y	N	14
2	1	27	Alpha	Name	20	Y	N	19
3	3	3	Alpha	Date created	6	Y	Y	39
4	3	27	Alpha	Type	3	Y	Y	45
5	5	3	Alpha	Description	40	Y	N	48
6	7	3	Num/0	Supplier1	6	Y	Y	88
7	7	23	Num/0	Price1	6	Y	Y	94
8	7	39	Num/0	Supplier2	6	Y	Y	100
9	7	57	Num/0	Price2	7	Y	Y	106
10	9	3	Num/0	Supplier3	6	Y	N	113
11	9	23	Num/0	Price3	7	Y	N	119
12	9	39	Num/0	Supplier4	6	Y	N	126
13	9	57	Num/0	Price4	7	Y	N	132
14	11	3	Alpha	System1	3	Y	Y	139
15	11	23	Alpha	System2	3	Y	Y	142
16	11	39	Alpha	System3	3	Y	Y	145
17	13	3	Alpha	Rating	2	Y	N	148
18	15	3	Alpha	Ref1	6	Y	Y	150
19	15	23	Alpha	Ref2	6	Y	Y	156
20	15	39	Alpha	Ref3	6	Y	Y	162
21	15	57	Alpha	Ref4	6	Y	Y	168

Fig 5 File Format Printout

Data input and amendment

Records are added through the Record Insert function. The function prompts for the key value (which for keys longer than eight characters may be abbreviated to eight), and then displays a formatted screen on which the information will be shown. The package prompts for the value of each field in turn; the value is typed in at the bottom of the screen, validated or transformed by calculation if appropriate, and then displayed in the appropriate field in the screen display. Thus you do not get the facility of moving the cursor around in the display area to enter or amend information. If you decide that an earlier field is incorrect, you must 'cycle' through each field in turn, typing one character and pressing RETURN, until the prompt area displays the name of the field you wish to amend. A similar process is used for Record Amendment, with a few refinements. The method of entering data away from the screen display format means that correcting data involves re-entering the whole field — you can't just change what's wrong. But you can append information to existing character fields. You can also decide 'on the fly' to have a field take the same value as the corresponding field in the previous record.

Record retrieval by exact key match is reasonably fast — just under three seconds on my 1000-record Benchtest file. The commands for insertion, deletion, amendment and viewing of individual records, retrieved by main key, although separate commands, can also be invoked from each other without having to return to the main menu. So you can retrieve a record for inspection, decide that unexpectedly it has an error, 'toggle' to Record Amendment, and correct the error. The choice process is quite carefully designed; you continue in Record Insert or View or whatever mode you started in until function key 7, the universal exit key, is pressed. You then have the choice of carrying out any of the other operations or returning to the one you first thought of. Fig 6 shows the display at the point where you are invited to choose your next record 'housekeeping' function. You will see that the options include 'print'; you can also take a direct 'snapshot' of the screen while the data is being displayed by pressing function key 4.

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

Screen display

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

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used via the Select File function, which has two drawbacks. Firstly, data can be viewed with the alternate formats but not amended. Secondly, and probably much more of a nuisance, before using an alternate format you must set up a Selection Criteria file to choose which record to display, even if you want to show every record in the file. This is not a lengthy process, but it is irritating to have to do it — and since the alternate format is the only way one can get field totals displayed on the screen, one might want to use alternate format on the whole file quite often in some applications.

The other display format provided is a simple list of all or a selection of records, with only limited formatting options. The most common application of this would be to list some fields in each of a set of records, in order to get the records shown together on the screen — indeed this is the only way that you can display several records on the screen at the same time. The approach is to ask the user to specify which fields are to be listed, using which index, and then list each record in turn, until the ESC key is pressed. Listing continues when the ESC key is pressed again. You have the option of displaying the list on the screen, or of sending it to the printer. But you can't scroll through the list on the screen until you get to the desired point, and then use function key 4 to take a 'snapshot', as you can with Record View, etc; you must decide in advance if you want to have printed information about a particular group of records. Nor can you opt to start at a particular point in the file — scrolling just begins at the beginning.

Printed reports

Tomorrow's Office provides, in addition to the 'screen snapshot' key and the functions for printing individual records or simple lists of records, two functions specifically for printing formatted reports. One caters specifically for label printing, while the other provides a more general report format. Within a report, extra fields may be used to calculate results depending on a series of arithmetic operations; you may also request up to three sub-total fields and grand totals. (All these calculations are subject to the limitations I've noted later in the section on 'Calculation'.) Each sub-total field may have different 'break and reset' tests, actions and effects on printing. Any heading or field may be underlined if desired. Here I thought the menu/option approach came into its own, and I found this section easier to use than is often the case — apart from the usual difficulties with specifying the printing positions by absolute line and column numbers. Report formats are stored so that they can be re-used repeatedly; they can also be amended to form the basis of new formats.

Selection

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

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

Sorting

Records in Tomorrow's Office files are never physically sorted; instead, you request the creation of an index, a term which the package uses to mean both a list of pointers to records *ordered* in some other way than by primary key, and a set of pointers to a *subset* of the whole file of records. (Indeed, the option for sorting is actually called Extract and Sort.) Ordering of records may be by up to three complete fields — you can't concatenate fields to increase the depth of sorting, nor can you utilise your knowledge of the data to ask for sorting on only part of the field. Sorting is very quick (see Fig 8 for the Benchtest), but it needs to be, for several reasons. In particular, the indexes are not kept up-to-date when data is amended, so the file must be re-indexed each time changes are made which could affect the ordering or subsetting.

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

Calculation

Calculations can be carried out on fields within individual records, or on aggregations of records. Fields can take a calculated value when inserted or amended (this must be defined in the master format), or on update; in either of these circumstances the calculated value is placed in the appropriate field in the file. This makes it possible to increase all current prices by ten per cent or work out and store the total value of an invoice from the value of the individual items and the VAT rate. Calculations can also be carried out when reports are printed. Arithmetic operations provided are the usual add, subtract, multiply, divide and some commercially useful functions such as per cent. You can operate on constants, field values, or a worked area — two are provided principally to cope with the lack of brackets to alter the natural sequence of evaluation. These facilities work very like a calculator with two memories, no brackets or scientific functions, and no ability to carry out operations conditionally. In addition, field values can be totalled and displayed on the screen as part of the automatic update feature, and totals and sub-totals provided during the printing of reports.

Multiple files

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

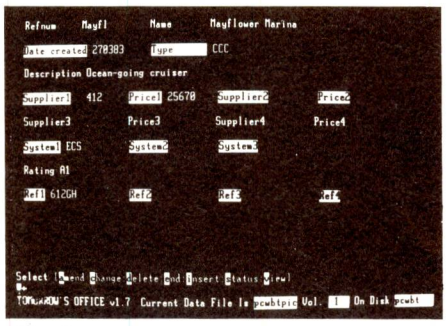

Fig 6

BM1	Time to add 1 new field to each of 1000 records	40 mins
BM2	Time to add 50 records interactively	1 sec/record
BM3	Time to add 50 records 'in a batch'	NT
BM4	Time to access 50 records from 1000 sequentially on 25-character field: with simple search	5 mins*
	with stored search criteria	3 mins* + set-up time
BM5	Time to access 50 records from 1000 by index on 25-character field	BM6 + 1 sec + scrolling
BM6	Time to index 1000 records on 25-character field	5 mins 23 secs
BM7	Time to sort 1000 records on 5-character field	4 mins 45 secs
BM8	Time to calculate on 1 field per record and store result in record	8 mins
BM9	Time to total 3 fields over 1000 records	5 mins 20 secs
BM10	Time to import a file of 1000 records	1 hour 34 mins

Notes: * includes scrolling NT Not Tested

Fig 8 Benchmark Times

TOMORROW'S OFFICE

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

Tailoring

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

Security and reliability

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

Housekeeping

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

Links with outside

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

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

User image: software

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

That combination — good points with occasional disappointments — became very much the pattern of my interaction with Tomorrow's Office. Much of the prompting is very good. For instance, whenever you want to use a subset of the data or look at it in a particular order, the package lists the available selections and indexes for you to choose, and the names have descriptions to go with them, so you can remember easily what each one contains. And the 'current file' remains the current data file even between runs of the program — Tomorrow's Office remembers which file you were using before you last switched off the system. On the other hand, the frequent need to swap disks is a real irritant; in most packages the program disk is on one disk drive and the data disk on the other. This should be quite easy to achieve on the Sirius, which under MS-DOS gives 620k of file space per drive. Tomorrow's Office uses three program disks, one or more data disks (files can be copied, eg, when modifying the file structure, only from one disk to another), and a separate disk for batch input files. Disk changing was made even more traumatic for me by the package's use of the Sirius bell, which drove me crazy. Every time you are asked to change disks, the bell is rung, not once but *five* times! And this at a time when you are likely to be sitting watching the terminal anyway, knowing that the current set of interactions is not complete. Yet, at other times when the bell would be helpful — for instance, after the indexing program has been run, taking about five minutes for my 1000 records (a long enough time for me normally to go away and do something else), — the program is silent, and simply displays a message.

GO TO page 183

Summary

Package Type	Data management: single file or master file with associated transaction file.
Facilities	Selection, ordering by indexes (not kept up-to-date automatically), calculation in and across records, updating on primary key, good reporting, import and export of files.
Ease of Use	Very good, with a few small exceptions.
Error Messages	Clear and immediate.
Documentation	Clear and thorough — but no index to Reference Manual; good Training Guide.
Costs	£695 including software updates during the lifetime of the package and 'hot-line' telephone support.
Supplier	Stage One Software, Poole, Dorset. Tel (0202) 735656

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HITACHI MB16001



The MB16001 — to be launched here in July — boasts complete compatibility with non-graphic software for the IBM. With this advantage its sales success seems guaranteed. Steve Withers benchtested the machine in the Antipodes and reports back to us on his findings.

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

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

Hardware

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



Photography by Ian Dobbie

A useful document holder is attached to the main unit.



The keyboard is not as pleasant to use as it is to look at.



Colour only in the UK.

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

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

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

There are two main circuit boards, each a little larger than an A4 page, mounted behind and parallel with the document holder. I was unable to take a good look at either of them without dismantling the machine further than I cared to, but one seems to be the computer itself (with edge connectors for expansion boards) while I suspect the other is the display generator. For servicing, two screws at the back secure the cover of the expansion area, while another two hold the rest of the shell in place. The snags are that the accessory cards must be removed (this involves undoing various screws and brackets) before either of the main boards can be extracted, and there are a large number of connectors between the various modules. Hitachi does not seem to have gone out of its way to make life easy for service engineers as, in addition to these problems, very few chips are socketed. Perhaps the company feels its product is so reliable that there is no need to worry about such things.

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

The 5¼ inch double-sided slimline drives are fitted, with a capacity of 320k each, giving a very useful amount of storage in a small space. They don't make much noise, but they do sound smooth — the heads load with a 'click', instead of a 'clunk'. In order to reduce the risk of accidental damage to a diskette, an interlock is fitted which stops the clamping mechanism putting any pressure on a disk which is not fully inserted in the drive. The disk controller, which can handle up to four drives, occupies one of the expansion slots on the main board.

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

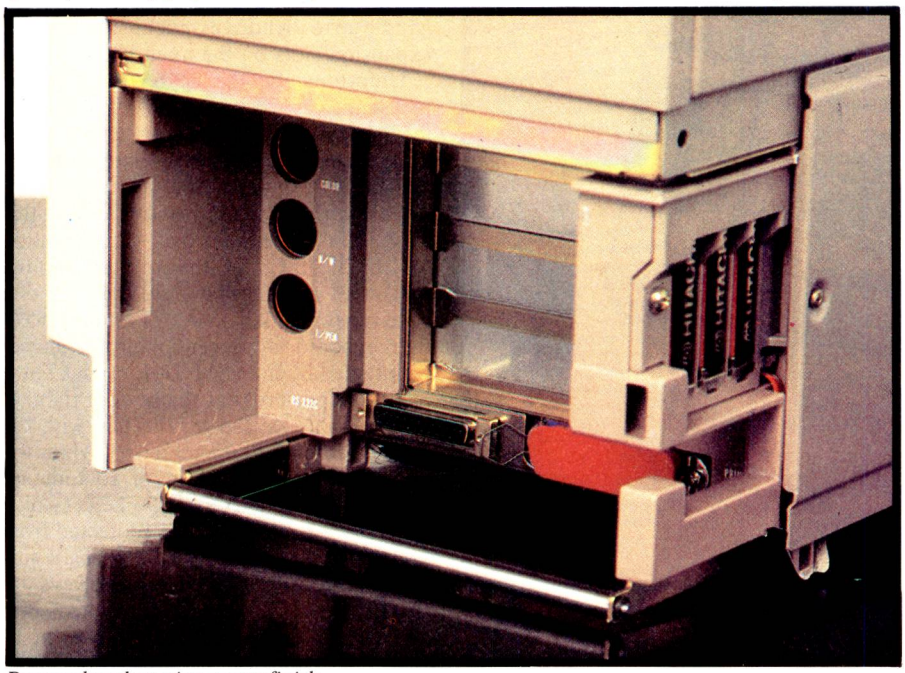
The reset button is mounted on the rear edge of the keyboard, with adequate protection in the form of a raised legend. A generous length of coiled cable and a DIN plug connects keyboard and computer; the computer's socket being below and slightly to the left of the second disk drive. The length of the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



Hi-tech controls.

give a conventional slope to the keys.

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

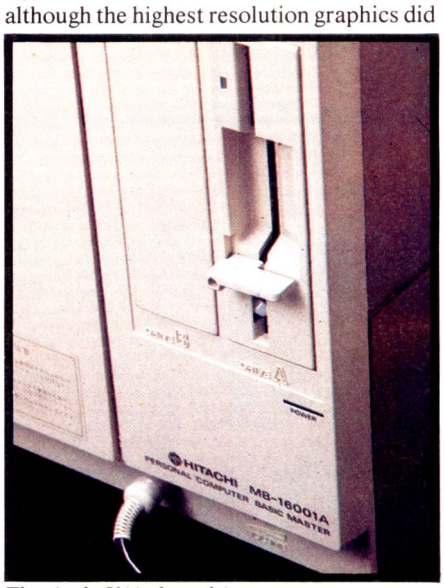


Recessed sockets give a neat finish.

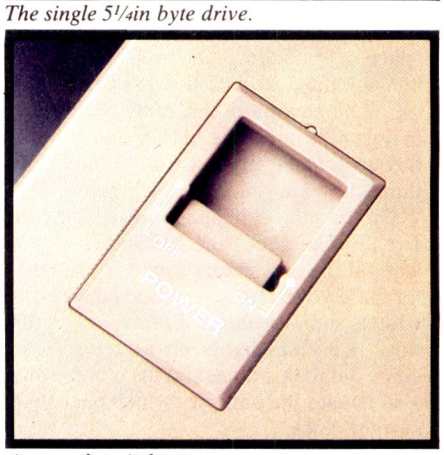
The text and graphics displays are independent of each other, and either or both may be shown on the physical screen. This could be useful when debugging a graphics program, as the program can be listed and edited without disturbing the graphics — the text simply scrolls over the top. Interlacing is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

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

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



The single 5¼in byte drive.



A smooth switch.

Basic Keywords

Statements

AUTO
BEEP
BLOAD
BSAVE
CALL
CHAIN
CIRCLE
CLEAR
CLOSE
CLS
COLOR
COM(n) ON/OFF/STOP
COMMON
CONT
DATA
DEF FN
DEFINT/SNG/DBL/STR
DEF SEG
DEF USR
DELETE
DIM
DRAW
EDIT
END
ERASE
ERROR
FIELD
FILES
FOR NEXT
GET (file)
GET (graphics)
GOSUB RETURN
GOTO
IF THEN ELSE, IF GOTO ELSE
INPUT
INPUT#
KEY, KEY LIST/ON/OFF
KEY(n) ON/OFF/STOP
KILL
LET
LINE
LINE INPUT
LINE INPUT#
LIST
LLIST
LOAD
LOCATE
LPRINT, LPRINT USING
LSET, RSET
MERGE
MID$()=
NAME
NEW
ON COM (n)
GOSUB
ON ERROR GOTO
ON GOSUB, ON GOTO
ON KEY (n)
GOSUB
ON PEN GOSUB
OPEN
OPEN COM
OPTION BASE
OUT
PAINT
PALETTE
PALETTE USING
PEN ON/OFF/STOP
PLAY
POKE
PRINT
PRINT USING
PRINT#, PRINT USING#
PSET, PRESET
PUT (file)
PUT (graphics)
RANDOMISE
READ
REM
RENUM
RESET
RESTORE
RESUME
RETURN
RUN
SAVE
SCREEN
SOUND
STOP
SWAP
SYSTEM
TRON, TROFF
WAIT
WHILE WEND
WIDTH
WRITE
WRITE#

Functions

ABS
ASC
ATN
CDBL
CHR$
CINT
COS
CSNG
CSRLIN
CVI, CVS, CVD
DATE$, DATE
EOF
ERL
ERR
EXP
FIX
FRE
HEX$
INKEY$
INP
INPUT$
INSTR
INT
LEFT$
LEN
LOC
LOF
LOG
LPOS
MID$
MKI$, MKS$
MKD$,
OCT$
PEEK
PEN
POINT
POS
RIGHT$
RND
SCREEN
SGN
SIN
SPACE$
SPC
SQR
STR$
STRING$
TAB
TAN
TIME$, TIME
USR
VAL
VALPTR

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

Software

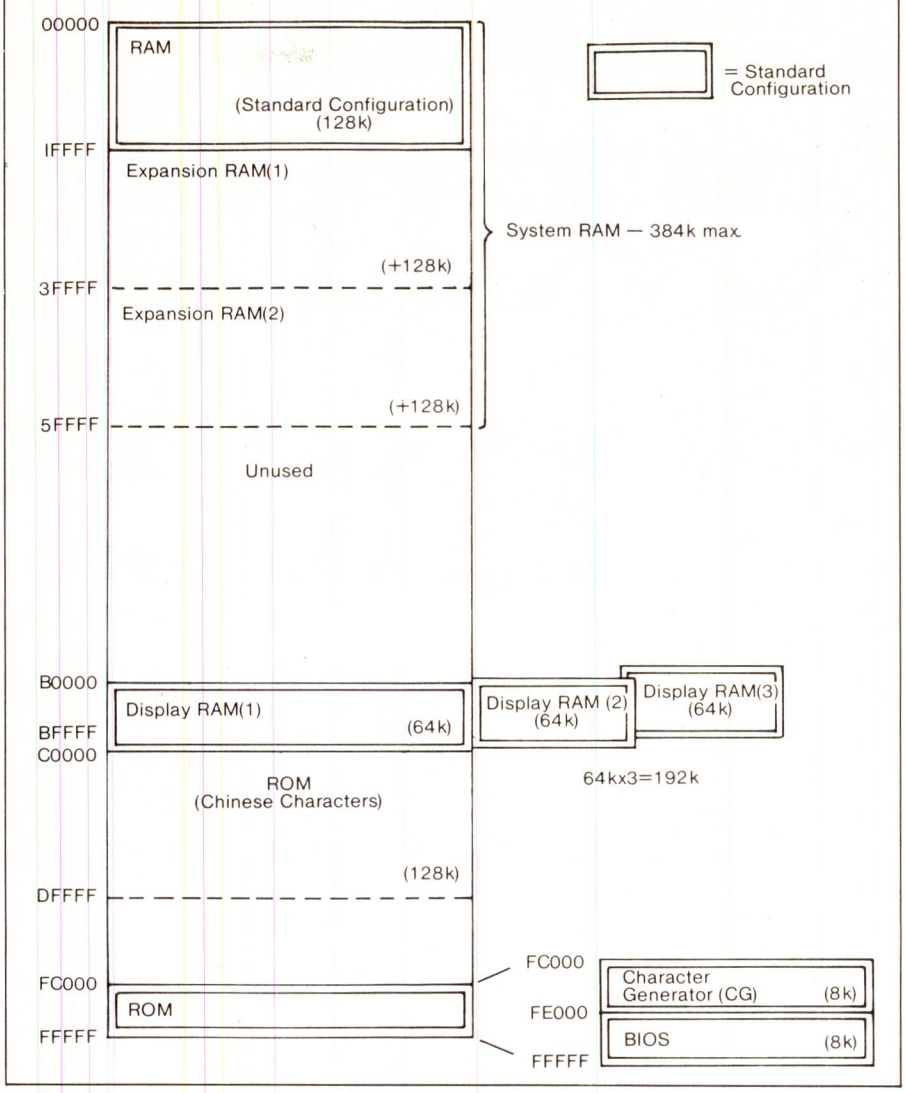
MS-DOS and Microsoft Basic are both included in the price of the MB16001. Enough has been written about MS-DOS in these pages, so I will only cover the unusual features. To start with (literally), the boot-up routine has been modified so that it reads the time and date from the system clock, and only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

The other main addition is a utility which sets the various system parameters stored in non-volatile memory. The options given by this program hint at expansion items that may appear in the future. It allows the selection of:
memory size from 64 to 1170k;
up to four 5¼ or 8 inch disk drives;
default settings for up to four RS-232 interfaces;
the default display modes; and
a RAM disk.

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

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

Memory Map



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

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

Benchmark timings

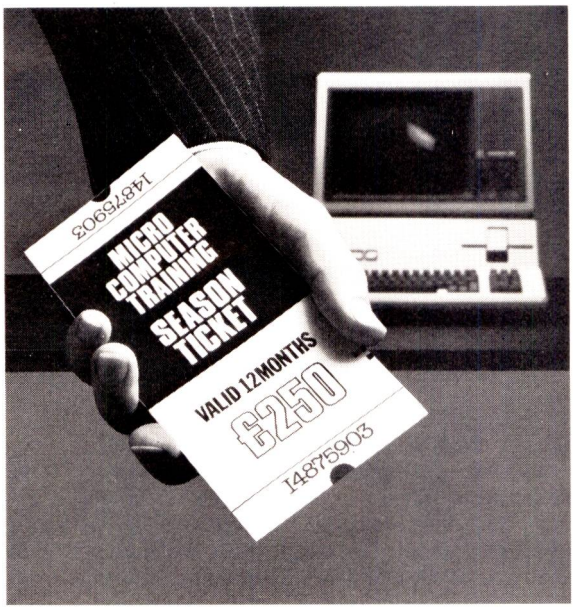
BM1	1.5
BM2	5.0
BM3	10.5
BM4	10.5
BM5	12.5
BM6	23.5
BM7	36.0
BM8	3.5

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

The MB16001 boasts complete compatibility with non-graphic software for the IBM, while graphics programs will need some changes to allow for the Hitachi's higher resolution. I found little to contradict this claim, except that the two Basics use different tokens. Also, the MB16001 cannot run the IBM's Basic interpreter as much of the latter is stored in ROM. This means that programs must be saved as ASCII files and not in the usual tokenised form if they are to be transported between the two machines.

The Benchmark times for the MB16001 are very respectable, and would put the

This'll do even more nicely!



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Technical specifications

Processor	8088
Memory	128k RAM, 8k BIOS ROM, 8k character generator ROM, 192k screen RAM
Screen	14in colour monitor. 24 rows of 40 or 80 characters, graphics resolution to 640x400, 15 colours. Monochrome optional.
Keyboard	97 typamatic keys, including function, numeric, and special keys.
Disks	Two slimline double-sided, double-density 5¼in drives.
Interfaces	Centronics parallel, RS-232 serial.
Operating system	MS-DOS
Languages	Microsoft Basic (others as options)
Dimensions	30cm x 49cm x 25cm

machine in equal fifth place in the 'league table' published in *PCW* November 1982 (remember that BM8 now performs 1000 iterations). Since we do not use a set of graphics Benchmarks (we had enough trouble with the disk tests), an assessment of a machine's speed in this area is necessarily subjective, and questions of resolution and number of colours cloud the issue. The MB16001 does seem to perform well in this area: at 640x200 resolution, drawing and filling in the largest possible right-angled triangle took four seconds.

Also supplied with the review system were Wordstar (configured for the IBM) and Zork I (likewise). The Wordstar customisation makes good use of the special keys on the MB16001, while the 'standard' control keys still work. I must admit to spending a lot of time playing Zork — it's a very engrossing adventure-type game with many puzzles to test the imagination.

Hitachi is optimistic that there will be a range of business software for the machine. The only applications packages available from the company itself are Wordstar, Spellstar and a first generation spreadsheet product, BM-Calc, written by Hitachi. 'But some 20 packages were demonstrated running on the machine when we exhibited it at the Which Computer? Show last year,' said a Hitachi spokesman. Apparently the company has been approached by 85 software houses and 900 dealers all wanting to get involved in the machine.

Documentation

The documentation supplied with the review system was an advanced draft in the form of a 3.5cm wad of unbound A4 paper.

English language documentation for MB16001 operations, MS-DOS and GWBasic has been produced by Hitachi in Japan. It will be presented in ring binder format but was not available at press time.

The locally revised manual I used is distinctly better than much of the documentation supplied with Japanese equipment, but it is a shame that one of the demonstration programs listed still plays the 'Rising Sun' anthem. There are many such sample programs illustrating different features of the language, as well as sections which describe the use of files, graphics, and machine code routines, as well as the everyday parts of the language. Apart from the page numbering, the fact that the manual separates statement and function keywords makes reference tricky (am I the only person who thinks a single alphabetical sequence would be better?).

Expansion

The MB16001's user memory may be expanded to either 256 or 384k. This limit is not justified in any way (there are enough slots for more memory cards), but I would hazard a guess that either power consumption or heat dissipation is the reason. Be warned that adding memory won't let you run bigger Basic programs — the Basic-86 interpreter uses a single 64k segment for program and variable storage — although compiled programs can span segments.

An external twin disk unit may also be connected to the standard controller, doubling the total capacity of the system. If this is inadequate, a pair of 8 inch drives can be added instead, although they require their own controller. In this case the total capacity is 2.64Mb (2x1Mb plus 2x320k). Even greater storage will be provided by a hard disk unit, but details of this were not available at the time of writing.

The manuals also mention a lightpen, as well as additional Centronics, and RS-232 interfaces. All these items should be in stock by the time the MB16001 is launched.

The expansion connectors have the same pin configuration as the IBM PC, but there is of course no guarantee that any particular card intended for the IBM will work perfectly (or even at all) in the MB16001.

Prices

The price for a standard system (as tested, but excluding Wordstar and Zork) has yet to be decided. Informed guesses put it between £2000 and £3000 but probably close to the top of this range. Prices for the add-ons are not yet known but, when they do appear, check whether installation is extra because the manuals warn that fitting them yourself will invalidate the warranty.

Conclusions

One thing is certain, the MB16001 — with features that are optional extras on competing machines — gives you a lot for your money. It has a standard operating system and a version of Basic that is as compatible with similar systems as an extended Basic ever can be. Compatibility (even if it is not absolute) with the IBM is a good selling point, as it increases the range of readily available software and hardware.

On price, competition with IBM will be close. An IBM Personal Computer with 128k RAM and colour monitor costs £3127 + VAT.

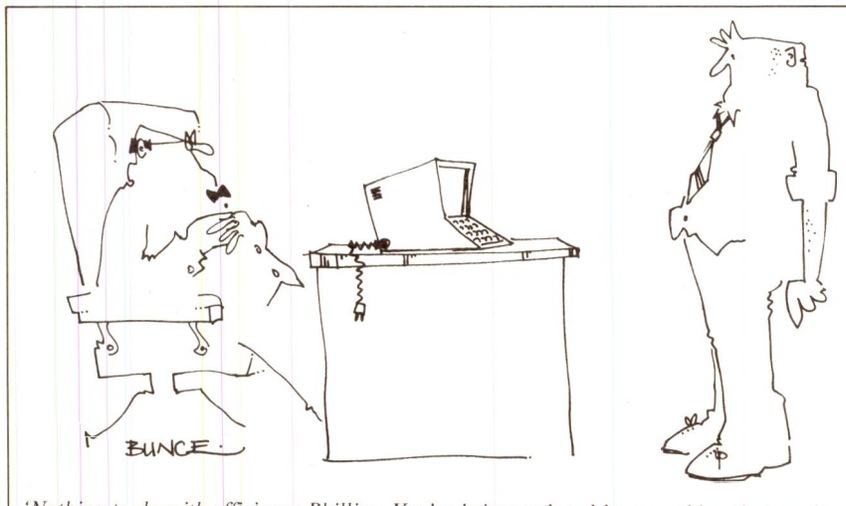
It is obviously a 'serious' business or professional computer, and it will be getting the software it deserves. If the system doesn't live up to its name I will be astounded.

Editorial note

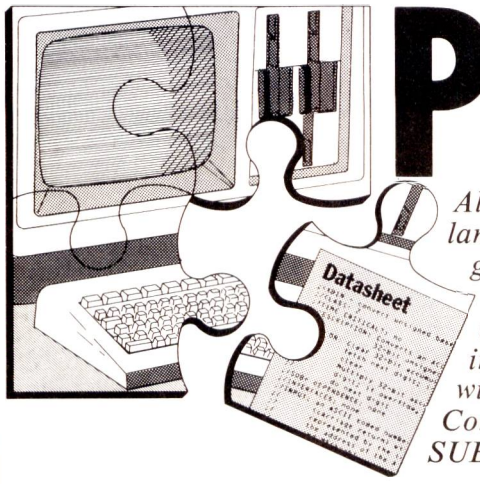
Steve Withers benchtested this machine in Australia which is the standard testing ground where Japanese manufacturers dry-run their products.

The UK version, scheduled for launch this July, is the same as the Australian version apart from some marketing details. Hitachi's Australian dealer, in its infinite wisdom, dubbed the machine The Hitachi Success. The UK company has thought better of this and here we have The MB16000 Series!

CP/M-86 is expected in Australia but is not planned for the UK. END



'Nothing to do with efficiency Phillips. You're being replaced by something that won't smoke, spill coffee or throw up in the office.'



PCW SUBSET

Alan Tootill and David Barrow present more useful assembler language subroutines. This is your chance to help build a library of general-purpose routines, documented to the standards we have developed together in this series. You can contribute a Datasheet, improve or develop one already printed or translate the implementation of a good idea from one processor to another. PCW *will pay for those contributions that achieve Datasheet status. Contributions (for any of the popular processors) should be sent to SUB SET,* PCW, *62 Oxford Street, London W1A 2HG.*

ROOT EXTRACTION

John Kerr of Glasgow has been thinking about, and working on, Steven Weller's fast square root programs (August 82) and the very attractive algorithm they used, with the object of seeing if this might be adapted to other roots. He has discovered that the algorithm can indeed be adapted for any root.

Here is John's account of the square root algorithm, showing how it is adapted for cube roots. You might like to try your hand at producing code from this, before we print John's 16-bit and 32-bit unsigned integer cube root routines for the Z80 next month.

In Mr Weller's algorithm for square root extraction, the input number is shifted left, two bits at a time, into a working accumulator. At some arbitrary stage in the process, the 'virtual input' is that part of the input which has been shifted in and operated upon; call it 'x'. The results of processing, so far, are a partial result 's' for the square root, and a partial remainder 'r' in the working accumulator:
virtual input = x,
partial result = s,
partial remainder = r,
these quantities being related by the equation: $s^2 + r = x$.

After the next round of processing, the virtual input has been augmented by the two-bit number 'y' (the next two bits of the real input). The next, least significant, bit of the result has been found; call it 'd', so the new partial result is 2s+d. The remainder has also changed:
virtual input = 4x + y,
partial result = 2s + d,
partial remainder = q.

So the previous equation now becomes: $(2s+d)^2 + y$. Combine the two equations to eliminate 'x', remembering that as 'd' is a single bit (zero or one), d^2 reduces to d. The result is:
$q = 4r+y$ when d=0, indicating that nothing has been subtracted from the working accumulator; or else,
$q = 4r+y - (4s+1)$ when d=1, ie, the result bit is set.

This shows that the required subtrahend is 4s+1; that is, the *previous* partial result shifted two places left, then incremented.

The same analysis can be applied to a hypothetical algorithm for extracting cube roots. It yields the subtrahend value which should be used, if the method is to be sound. Starting again at some arbitrary point during execution, we have:
virtual input = x,
partial result = c,
partial remainder = r,
this time related by the equation: $c^3 + r = x$.

Now the next *three* bits of the input number are shifted into the working accumulator, giving a new virtual input of 8x+y. After processing, a new result bit 'd' and a new partial remainder have been calculated:
virtual input = 1 + y,
partial result = 2c + d,
partial remainder = q,
and the relevant equation is: $(2c+d)^3 + q = 8x + y$. As before, the two equations are combined to eliminate the unknown 'x', and the result examined assuming d=0, then d+1. The first case (subtraction failed) gives: $q = 8r + y$. The second gives: $q = 8r + y - (12c^2 + 6c + 1)$.

This does not augur well for the direct method of cubic root extraction; the required subtrahend is an ugly quadratic function of the 'result-so-far', which looks like it will require recalculation, squaring and all, after each round of processing. Luckily, it doesn't; and after a little more algebra, the following algorithm, devoid of full-length multiplication, is obtained.

Clear accumulators for result (Res), subtrahend (Sub) & remainder (Rem). For each group of three input bits:
Shift three bits left into Rem (primary accumulator);
If Rem > Sub,
Then let Rem = Rem - Sub - 1;
  Res = 2*Res + 1;
  Sub=4*Sub + 18*Res.
Else let Res = 2*Res;
  Sub = 4*Sub - 6*Res.
Next group.

6809 TOKENISED TEXT

People are beginning to ask why Sub Set includes nothing for the 6809 processor used by the Dragon 32 and Tandy colour computers. In fact, somewhat ahead of this market, we had some 6809 code in the Sub Sets for June and September 1981 and that is all we have received — until now. We are prepared to pass on your 6809 Datasheets, untested for the time being, until we can determine the extent of your interest.

Michael Kerry of Seaford is the first of what might be a new wave of 6809 coders and our first Datasheet this month is his translation of Bruce Tanner's Z80 text expansion routine TOKN (November 82).

In this application, non-ASCII single byte tokens are used to represent common phrases or combinations of letters. Michael uses tokens in the range FFH to 80H, reversing the sequence used by Bruce. To adapt the example given by Bruce, a first token for the letters TH is defined as hexadecimal 54 48 00 (the zero byte terminating the definition); a second for THE as FF 45 00; a third for THEATRE as FE 41 54 52 45 00. The token FF in the definition of THE represents the letters TH and the token FE in the definition of THEATRE represents THE.

'Tokenised' text, ending in a zero byte, consists of ASCII characters and tokens. Using the three tokens defined, the text 'THIS THEATRE IS THE THIRD OF THREE THEATRES' would be tokenised with the hexadecimal bytes:
FF 49 53 20 FD 20 49 53
20 FE 20 FF 49 52 44 20
4F 46 20 FF 52 45 45 20
FD 53 00
'Tokenised' text has had a fascination for me since the time I used Bentley's Second Phase Code to save money on cables in overseas trading. 'Balance — are working; will telegraph later' is a phrase that sticks in my mind from many years ago. Why not think about the most useful phrases or combinations of letters for your text compression needs and send them in?

DATASHEET

```
;= TOKN - Expand tokenised text to ASCII
;/ CLASS:  2 (Does not save CC & A but position independent & re-entrant
;/ TIME CRITICAL?:  No
;/ DESCRIPTION:  Outputs ASCII text, expanding tokens into full text.
;/ ACTION:  Outputs all ASCII characters.  Recursively expands tokens.
;/ SUBr DEPENDENCE:  Subroutine OUTPUT to output the character
;/                     in the A register.
;/ INTERFACES:  1) Memory area holding text and tokens.  Tokens
;/                  are in the range hex FF thru 80 (-1 to -128).
;/              2) Memory area holding un-numbered token definitions,
;/                  each terminated by a null.  The first definition
;/                  corresponds to token hex FF.  Recursive definitions
```

```
;/                  are permitted.
;/ INPUT:  X points to the tokenised text.
;/         Y points to the definitions.
;/ OUTPUT:  Expanded text is output via subroutine OUTPUT.
;/ REGs USED:  CC, A, X, Y
;/ STACK USE:  (2+n) bytes, plus (4+n) bytes per level of recursion
;/                 when n is the amount used by OUTPUT.
;/ LENGTH:  29
;/ PROCESSOR:  6809

TKN1:  JSR    OUTPUT ;output ASCII byte in A.          BD FA 21
; Entry point is here
TOKN:  LDA    ,X+    ;get source text byte &           A6 80
                     ;point to next.
       BEQ    TKNX   ;exit if null byte.               27 15
       BPL    TKN1   ;token ? - no, output.            2A F7
       PSHS   X      ;save text pointer,               34 10
       TFR    Y,X    ;set text ptr within tokn tabl.   1F 21
TKN2:  INCA           ;count definitions.               4C
       BEQ    TKN4   ;jump when definition found.      27 06
TKN3:  TST    ,X+    ;search for end                   6D 80
       BNE    TKN3   ;of definition.                   26 FC
       BRA    TKN2   ;                                 20 F7
TKN4:  BSR    TOKN   ;recurse.                         8D EB
       PULS   X      ;restore text pointer.            35 10
       BRA    TOKN   ;continue.                        20 E7
TKNX:  RTS            ;exit.                           39
```

FOWIAD

Both John Hardman of Welling and D Swain of Muswell Hill have sent the same improvement to the FOWIAD routine which appeared in February's Sub Set. This improvement shaves one byte and two T-states off the original, so that it can now be fitted into one of the Z80 restart locations:

```
        EX    (SP),HL
FOWIAD: EX    DE,HL
        EX    (SP),HL
        ADD   HL,DE
        EX    DE,HL
        EX    (SP),HL
        EX    DE,HL
        RET
```

But look closely at the above code. Two different sequences of instructions have been used, both having the effect of an 'EX (SP),DE', using HL as an intermediary. Both sequences are three bytes in length but there is an enormous difference in execution time when EX (SP),HL takes 19 T-states and EX DE,HL only 4 T-states. By using the quicker sequence both times, the execution time of FOWIAD drops from 90 to 75 T-states.

That is just what Peter J H Fox of Luton did in the improved version he sent in (see Fig 1 below).

EX (SP),HL is a 1-byte, 19 T-state, Z80 instruction. EX (SP),IX or IY takes 2 bytes and 23 T-states. 'EX (SP),DE' can be achieved in 3 bytes and 27 T-states. Is there any call for 'EX (SP),BC' or even 'EX (SP),AF'? And how would you do it?

```
FOWIAD: EX    DE,HL    ;disp. to DE, original DE to HL.    EB
        EX    (SP),HL  ;original DE to stack, RET to HL.   E3
        EX    DE,HL    ;RET to DE, disp. to HL.            EB
        ADD   HL,DE    ;output in HL.                      19
        EX    DE,HL    ;output to DE,RET to HL.            EB
        EX    (SP),HL  ;RET to stack, original DE to HL.   E3
        EX    DE,HL    ;original DE to DE,output to HL.    EB
        RET            ;return                             C9
```

Fig 1

THOSE INTRIGUING 8085 INSTRUCTIONS

Peter Caunt of Knaresborough has written to tell of the mixed success he has had on testing the 9 unspecified instructions discovered by Jonathan Marten (February 1983).

His findings agree with Jonathan's on three of the instructions (see Fig 2 below).

However, Peter found code 10 (hexadecimal) to be a 'SRA HL', a 16-bit arithmetic shift retaining the sign in bit 15, and not the 16-bit rotation which Jonathan's machine thought it was. The 2-byte instructions, 28 bb and 38 bb which add immediate a single data byte value to HL and SP respectively were completely ignored by Peter's machine. Bit 5 of the flag register (supposedly a 'correct sign' flag, K) resisted all Peter's attempts to set it.

This raises an important point about unspecified instructions. The fact that they are unspecified does mean that they cannot be guaranteed to work at all or, even if they do, produce identical results on different chips.

Peter also tested the only other unused 8085 instruction, not mentioned in February. 08 works on his Alphatronic as 'SUB HL,BC' and sets flags accordingly.

What about the 8080? All the above mentioned codes and also 20H and 30H are unused by the 8080 processor — or are they? Perhaps some DAI-hard reader could furnish us with the answer.

18	'RL	DE' (ie, a 17-bit rotate left)
D9	'LD	(DE),HL'
ED	'LD	HL,(DE)'

Fig 2

HIP-HIP-ARRAY

How do you store a two-dimensional array of matrix in linearly addressed memory — column by column? — or row by row? Whichever way it is, MATRAN from John Hardman will let you reconfigure it.

DATASHEET

```
;= MATRAN - Matrix Transposition
;/ CLASS:  1
;/ TIME CRITICAL?:  No
;/ DESCRIPTION:          In RAM move of a two dimensional array
;/                       or matrix effecting a change from
;/                       sequential row storage at source to
;/                       sequential column storage at destination,
;/                       or vice versa.
;/ ACTION:  For each column of Source
;/              Save Source pointer
;/              For each row of Source
;/          Move element from Source to Destination
;/          Increment Destination pointer
;/          Add No. of columns to Source pointer
;/          Restore Source pointer
;/          Increment Source pointer
;/ SUBr DEPENDENCE:  None
;/ INTERFACES:  Destination area of RAM equal to Source area of RAM
;/ INPUT:  HL is pointer to start of Source matrix
;/         IX is pointer to start of Destination
;/         B is no.  of rows in Source matrix (1 to 255)
;/         C is no. of columns in Source matrix (1 to 255)
;/ OUTPUT:  Transpose of Source matrix at Destination
;/          All registers returned unaltered
;/ REGs USED:  B C HL IX
;/ STACK USE:  12
;/ LENGTH:  35
;/ TIME STATES:  (rows * 60 + 67) * cols + 129
;/ PROCESSOR:  Z80

MATRAN: PUSH  HL      ;save registers                  E5
        PUSH  IX      ;                                DD E5
        PUSH  BC      ;                                C5
        PUSH  DE      ;                                D5
        PUSH  BC      ;save no. of rows                C5
        LD    E,C     ;move no. of columns to DE       59
        LD    D,+0    ;                                16 00
COLLP:  PUSH  HL      ;save start of column address    E5
ROWLP:  LD    A,(HL)  ;copy element from Source        7E
        LD    (IX+0),A;to Destination                  DD 77 00
        ADD   HL,DE   ;point to next row, same column  19
        INC   IX      ;point to next Dest.  column     DD 23
        DJNZ  ROWLP   ;repeat for each row in column   10 F7
        POP   HL      ;recover start of column pointer E1
        INC   HL      ;and point to next column        23
        LD    A,C     ;temporarily saving no.  of cols. 79
        POP   BC      ;left to do in A, recover no. of C1
        PUSH  BC      ;rows in B                       C5
        LD    C,A     ;get no.  of columns back into C 4F
        DEC   C       ;and repeat for all columns      0D
        JR    NZ,COLLP;                                20 ED
        POP   BC      ;remove no.  of rows from stack  C1
        POP   DE      ;restore registers               D1
        POP   BC      ;                                C1
        POP   IX      ;                                DD E1
        POP   HL      ;                                E1
        RET           ;and return                      C9
```

John says that he has tried to adapt the routine to put the transposed matrix back into the same area of memory as the source matrix but has been unsuccessful.

Now, although I cannot myself see a need for turning the rows and columns of a two-dimensional array of matrix about in the same area (doesn't mean to say that there isn't one), it seems that a nifty little algorithm would be required to do it without using any other workspace. Such an algorithm could just be useful in other, more important, contexts or might give an insight on how to deal with similar but more complex problems.

DYNAMIC STORAGE

Quote of the month from John Kerr, referring to one of his less successful coding efforts: 'due to an extraneous 'RET', it uses the peculiar technique of storing an intermediate result in the program counter. . .'

We all use that technique, John.

END

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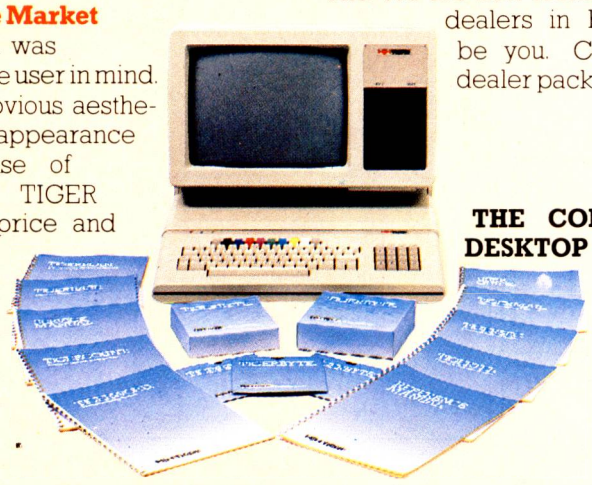

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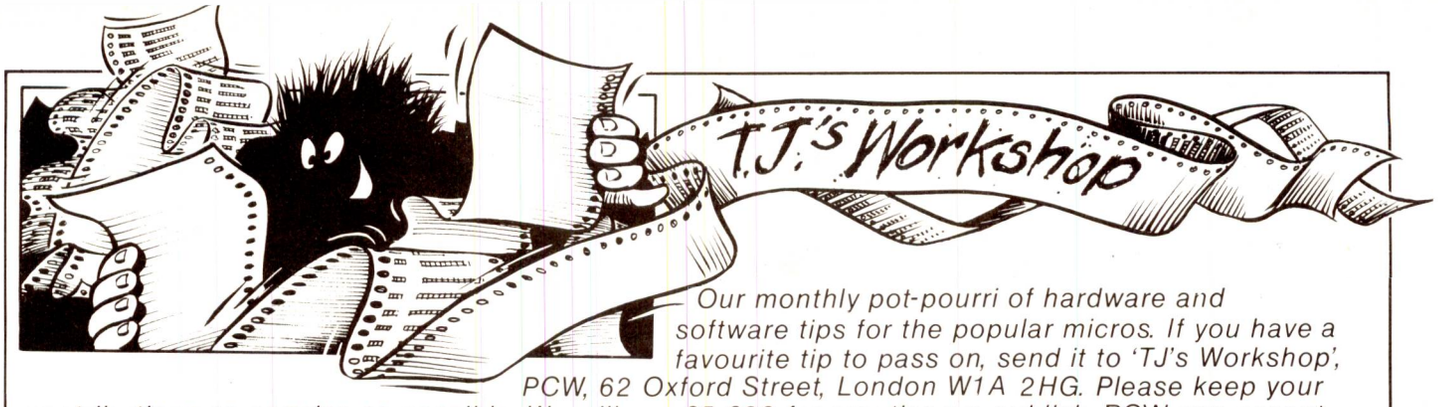

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VARIABLE SEARCH

Thinking that most people who do any programming of a reasonable length sometimes lose variables, I hope this routine will be of some help. It searches through the variables section in the memory of any ZX Spectrum, and will print out the names and types of every variable used in the program. If you know what variables should have been used, then coming across an odd one should point out a bug. If you need a list of variables to aid conversion to a different machine, this will provide them. Running short of memory? Pruning a few variables will save some. The uses are numerous.

The whole routine fits into 185 bytes of machine code. Running the program shown stores it in a REM statement; POKE 23756,0 will prevent it from deletion. The rest of the program can be removed by typing in the line numbers — do not use NEW. Then PRINT; :RANDOMIZE USR 23760 will list all the variables that have been set up on the screen.

For example:

n FOR NEXT	FOR NEXT loop variable;
a()	Numeric array;
time	Ordinary numeric variable;
x$	String variable;
c$()	String array.

If there are too many to fit on one screen, the computer will ask 'scroll?' in its usual annoying fashion. The REM statement will MERGE into any program that leaves enough memory, so you can use it with existing programs that you want to modify or send off to a magazine.

Bill Longley

```
    1 REM .....................
.....................
.....................
.....................
.....................
.....................
  10 FOR g=23760 TO 23944: READ
a: POKE g,a: NEXT g
  90 DATA 42,75,92,126,203,127,2
02,230
 100 DATA 92,203,119,202,238,92,
203,111
 110 DATA 202,64,93,195,92,93,20
3,111
 120 DATA 202,115,93,195,246,92,
203,111
 130 DATA 202,36,93,195,7,93,230
,31
 140 DATA 71,62,96,176,215,17,6,
0
 150 DATA 25,62,13,215,195,211,9,
2,230
 160 DATA 31,71,62,96,176,215,35
,126
 170 DATA 203,127,32,3,215,24,24
7,230
 180 DATA 127,215,17,6,0,25,62,1
3
 190 DATA 215,195,211,92,230,31,
254,0
 192 DATA 200,71,62,96,176,215,6
2,40
 194 DATA 215,62,41,215,35,94,35
,86
 200 DATA 25,35,62,13,215,195,21
1,92
 210 DATA 230,31,71,62,96,176,21
5,62
 220 DATA 36,215,62,40,215,62,41
,215
 230 DATA 35,94,35,86,25,35,62,1
3
 240 DATA 215,195,211,92,230,31,
71,62
 250 DATA 96,176,215,62,235,215,
62,243
 260 DATA 215,17,12,0,25,62,13,2
15
 270 DATA 195,211,92,230,31,71,6
2,96
 280 DATA 176,215,62,36,215,35,9
4,35
 290 DATA 86,25,35,62,13,215,195
,211
 300 DATA 92
```

ATOM BINARY COUNT

This routine provides the Atom with a binary printout facility.

The program should be typed in and then run. The machine code should then be saved on tape as shown in the program. The basic program can now be erased by typing NEW.

To use the facility the SHUT command is used —eg, typing 'SHUT 198' will cause the binary number 11000110 to be printed out.

It is also useful to find which bits in a byte are set or un-set. Typing 'SHUT? B001' will tell you which bits of Port B of the PIA are set.

The routine only prints out the first eight binary bits of a number so, for example, typing 'SHUT 301' would give 00101101 and is equivalent to 'SHUT 45'.

John Friar

```
>LIST
   10 REM BINARY NUMBER
   20 REM PRINT ROUTINE
   30 DIM RR(5)
   40 PRINT $21
   50 FOR J=1 TO 2
   60 REM ASSEMBLE AT
   70 REM #2800
   80 P=#2800;L=P
   90[
  100 STY #80
  110 LDX @#8
  120:RR0 LDA #80
  130     BPL RR2
  140     BMI RR3
  150:RR1 ASL #80
  160     DEX
  170     CPX @#0
  180     BEQ RR4
  190     JMP RR0
  200:RR2 LDA @#30
  210     JSR #FFF4
  220     JMP RR1
  230:RR3 LDA @#31
  240     JSR #FFF4
  250     JMP RR1
  260:RR5 LDA @#00
  270     STA #21A
  280     LDA @#28
  290     STA #21B
  300:RR4 RTS
  310]
  320 NEXT J
  330 PRINT $6,$12
  340 @=5
  350 PRINT"TO SAVE TYPE
"'
  360 PRINT"*SAVE""BINAR
Y"""&L,&P,&RR5''
  370 PRINT"TO LOAD TYPE
"'
  380 PRINT"*RUN""BINARY
"""&RR5''
  390 @=0
  400 PRINT"TO SET UP VE
CTORS AFTER PRESSING"
  410 PRINT"THE BREAK KE
Y TYPE"'
  420 PRINT"LINK #"&RR5'
'
  430 LINK RR5
  440 END
```



MORE NOTES ON THE SUPERBOARD

While the contribution to TJ's Workshop from David Eastlake on music for the UK101 (September 1982) was useful in principle, the idea can be significantly improved. Firstly, POKEing 61440 with either 64 or 0 will disable the cassette; using 81 and 17 instead will have the desired effect of switching RTS on and off without corrupting the cassette interface. Secondly, Basic isn't fast enough to give a reasonable range of notes, and rapidly changing notes are virtually impossible. Thus, when I decided to produce music on my Superboard, I wrote a machine code routine to produce the sound, a full assembled listing of which is given. As printed it is located at the end of memory on an 8k machine, and should be protected by answering 7979 to MEMORY SIZE. To use the routine, first set the USR vector with POKE11,51:POKE12,31 then execute the instruction X3+USR(D*256+F/8) where F is the required frequency of the note (in Hz) and D is the duration (in 32nds of a second). For example, to have half a second of a note at 600 Hz, use X+USR(16*256+600/8) or more simple X+USR(4171). F can be in the range 56 to 2040 and D can be in the range 0 to 127 (D can be larger, up to 255, if you make the argument of USR the appropriate negative value corresponding to a positive value greater than 32767). If D=0 then the programe will produce just one cycle of the note.

Here is a small Basic program that produces a variety of different sounds using the routine, many of which I'm sure you can imagine uses for in your latest Invaders program.

Those musically inclined can no doubt squeeze tunes out of their computers with a bit of extra software — how about a quick burst of the Death March when you finally get eaten/squashed/blasted for example?

On the hardware side, I didn't find it necessary to use anything as advanced as an amplifier. I simply inserted a spare 74LS04 from U68, then took the signal from pin 6 of J2. This, when connected with ground across an 8 Ω 0.5W speaker produced a sound of perfectly adequate volume.

David Harrison

```
10 POKE11,51:POKE12,31
20 FOR H=ITO40:FOR F=7TO254STEP16:X=USR(F):NEXTF,H
30 FOR F=7TO254STEP8:X=USR(256+F):NEXT
40 FOR F=254TO7STEP»8: USR(256+):NEXT
50 FOR H=1TO50:X=USR(519+RND(1)*250):NEXT
60 FOR F=254TO7STEP».5:X=USR(F):NEXT:X=USR(16391)
70 GOTO20
```

```
  1Ø ØØØØ          ; Music Software
  2Ø ØØØØ          ; --------------
  3Ø ØØØØ          ;
  4Ø ØØØØ          ;  Main program
  5Ø ØØØØ          ;
  6Ø 1F2B                ¥=Ø1F2B
  7Ø 1F2B ØØ       RMNDR .BYTE Ø
  8Ø 1F2C ØØØØ     CYCLE .WORD Ø
  9Ø 1F2E ØØØØ     MCAND .WORD Ø
 1ØØ 1F3Ø ØØØØ     DVDN .WORD Ø
 11Ø 1F32 ØØ       DVSR .BYTE Ø
 12Ø 1F33 2ØØ5AE   JSR ØAEØ5
 13Ø 1F36 A5AE     LDA ØAE
 14Ø 1F38 8D2F1F   STA MCAND
 15Ø 1F3B A9ØØ     LDA #Ø
 16Ø 1F3D 8D2F1F   STA MCAND+1
 17Ø 1F4Ø A5AF     LDA ØAF
 18Ø 1F42 2Ø9E1F   JSR UNSPM
 19Ø 1F45 18       CLC
 2ØØ 1F46 6E2D1F   ROR CYCLE+1
 21Ø 1F49 6E2C1F   ROR CYCLE
 22Ø 1F4C 18       CLC
 23Ø 1F4D 6E2D1F   ROR CYCLE+1
 24Ø 1F5Ø 6E2C1F   ROR CYCLE
 25Ø 1F53 A9Ø6     LDA #6
 26Ø 1F55 8D311F   STA DVDN 1
 27Ø 1F58 A96D     LDA #1Ø9
 28Ø 1F5A 8D3Ø1F   STA DVDN
 29Ø 1F5D A5AF     LDA ØAF
 3ØØ 1F5F 8D321F   STA DVSR
 31Ø 1F62 2ØCD1F   JSR UNSPD
 32Ø 1F65 AC3Ø1F WOOF LDY DVDN
 33Ø 1F68 A951     LDA #81
 34Ø 1F6A 8DØØF8   STA 614ØØ
 35Ø 1F6D 2Ø951F   JSR DELAY
 36Ø 1F7Ø A911     LDA #17
 37Ø 1F72 8DØØF8   STA 614ØØ
 38Ø 1F75 AC3Ø1F   LDY DVDN
 39Ø 1F78 2Ø951F   JSR DELAY
 4ØØ 1F7B AD2C1F   LDA CYCLE
 41Ø 1F7E F9Ø6     BEQ LOB1
 42Ø 1F8Ø CE2C1F   DEC CYCLE
 43Ø 1F83 4C651F   JMP WOOF
 44Ø 1F86 CE2C1F LOB1 DEC CYCLE
 45Ø 1F89 AD2D1F   LDA CYCLE+1
 46Ø 1F8C F9Ø6     BEQ LOB2
 47Ø 1F8E CE2D1F   DEC CYCLE+1
 48Ø 1F91 4C651F   JMP WOOF
 49Ø 1F94 6Ø     LOB2 RTS
 5ØØ 1F95 A2ØD   DELAY LDX #13
 51Ø 1F97 CA     AGAX DEX
 52Ø 1F98 DØFD     BNE AGAX
 53Ø 1F9A 88       DEY
 54Ø 1F9B DØF8     BNE DELAY
 55Ø 1F9D 6Ø       RTS
 56Ø 1F9E          ;
 57Ø 1F9E          ; Multiplication Routine
 58Ø 1F9E          ;
 59Ø 1F9E 48     UNSPM PHA
 6ØØ 1F9F A9ØØ     LDA #Ø
 61Ø 1FA1 8D2C1F   STA CYCLE
 62Ø 1FA4 8D2D1F   STA CYCLE+1
 63Ø 1FA7 68       PLA
 64Ø 1FA8 A2Ø8     LDX #8
 65Ø 1FAA 18     LOOP CLC
 66Ø 1FAB 2E2C1F   ROL CYCLE
 67Ø 1FAE 2E2D1F   ROL CYCLE+1
 68Ø 1FB1 ØA       ASL A
 69Ø 1FB2 9Ø15     BCC NOC1
 7ØØ 1FB4 A8       TAY
 71Ø 1FB5 AD2C1F   LDA CYCLE
 72Ø 1FB8 18       CLC
 73Ø 1FB9 6D2E1F   ADC MCAND
 74Ø 1FBC 8D2C1F   STA CYCLE
 75Ø 1FBF AD2D1F   LDA CYCLE+1
 76Ø 1FC2 6D2F1F   ADC MCAND+1
 77Ø 1FC5 8D2D1F   STA CYCLE+1
 78Ø 1FC8 98       TYA
 79Ø 1FC9 CA       NOC1 DEX
 8ØØ 1FCA DØDF     BNE LOOP
 81Ø 1FCC 6Ø       RTS
 82Ø 1FCD          ;
 83Ø 1FCD          ; Division Routine
 84Ø 1FCD          ;
 85Ø 1FCD A9ØØ   UNSPD LDA #Ø
 86Ø 1FCF 8D2B1F   STA RMNDR
 87Ø 1FD2 A211     LDY #17
 88Ø 1FD4 4CE81F   JMP START
 89Ø 1FD7 AD2B1F TOAD LDA RMNDR
 9ØØ 1FDA 9ØØ6     BCC CONT
 91Ø 1FDC ED321F   SBC DVSR
 92Ø 1FDF 4CEC1F   JMP NREST
 93Ø 1FE2 38     CONT SEC
 94Ø 1FE3 ED321F   SBC DVSR
 95Ø 1FE6 BØØ4     BCS NREST
 96Ø 1FE8 18     START CLC
 97Ø 1FE9 4CF91F   JMP MERGQ
 98Ø 1FEC 8D2B1F NREST STA RMNDR
 99Ø 1FEF 38       SEC
1ØØØ 1FFØ 2E3Ø1F MERGQ ROL DVDN
1Ø1Ø 1FF3 2E311F   ROL DVDN+1
1Ø2Ø 1FF6 CA       DEX
1Ø3Ø 1FF7 FØØ6     BEQ RTN
1Ø4Ø 1FF9 2E2B1F   ROL RMNDR
1Ø5Ø 1FFC 4CD71F   JMP TOAD
1Ø6Ø 1FFF 6Ø     RTN RTS
```

SPECTRUM INS & OUTS

Chapter 23 of the Sinclair manual mentions the use of the 'IN' command as a substitute for 'INKEY$'.

What it does not mention is that if the 'IN' command is used it enables several keys to be pressed at once. This can be very useful as it allows, for instance, multiple-player games.

The chapter gives a list of some of the most useful addresses for half-rows, but entire rows can also be used. The addresses for these can be found with a little patience using the following program:

```
10 FOR n=1 TO 10000
20 PRINT AT 10,10;n;AT 12,10;IN n
30 IF INKEY$='n' THEN NEXT n
40 GOTO 20
```

Pressing any key apart from 'n' will show whether the current 'IN' address detects that row. Pressing 'n' will increase the address by one.

The 'OUT' command, which is also dealt with in chapter 23 of the manual, can be used to produce flashing border effects useful for arcade games.

This is done by using the following routine:

```
10 FOR n=1 TO 100:OUT 200,RND * 255:NEXT n
```

Christian Livingstone and Piers Ludlow

NEWBRAIN CLOCK

Here's a tip for Newbrain owners, to put a digital clock onscreen. The clock is interrupt-driven, so by intercepting the interrupt it should be possible to have a clock onscreen while allowing normal operation of the machine — although the display would have to be effected using machine code. The program is entered as one line.

```
10 PUT 7,22,10,10 : a = PEEK(105)*256*256+ PEEK(106)*256+PEEK (107): h=INT(a/180000): a=a-180000*h: m=INT(a/3000): a=a-3000*m: a=INT(a/50): PRINT h[2.0];":";m[2.0]; ":";s[2.0]: GOTO 10.
```

A few notes on the above — PUT 7 turns the cursor off.

PUT 22 sends the cursor to the x,y address of the next two bytes (10,10 in this case). Loctions 105-107 are a 24-bit clock which counts the number of video frame blankings since the machine was switched on, and h, m and s are hours, minutes and seconds. The figures in square brackets after h, m and s control print format.

Stephen Burt

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BEEB DEBUGGING AID

This error-handling routine is for the BBC Micro, and is intended as an aid to debugging (and encourage the user's idleness!). When control is transferred to this routine, it will report the error, then list the line that gave rise to it. The routine has high line numbers for convenient *SPOOL –*EXEC use, and, since it fills the keyboard buffer using call 138, is suitable only for machines with O.S 1.0 or above. The routine first places the string 'L' into the keyboard buffer (32320,32330), then converts the two bytes at zero page locations 8 and 9 which, it turns out, contain the value for the function 'ERL', into a string of ASCII numerals which are placed sequentially in the buffer (32340 to 32370). Finally, the code for carriage return is appended (32380), causing the command to be performed.

Ian D Kerr

```
   10  ON ERROR GOTO 32700
   20  PRINT"THIS LINE OK"
   30 *FX0:REM M.O.S. doesn't like remarks
   40  PRINT"...no trailing
   50  A$=SIN(12*(64/1234)
   60  .....etc
   70
   80
   90
32300 REPORT:PRINT" in this:-"
32310 OSBYTE=&FFF4
32320 A%=138:X%=0:Y%=76:CALL OSBYTE
32330 Y%=46:CALL OSBYTE
32340 E$=STR$(!(8)AND&FFFF)
32350 FOR I%=1TO LEN(E$)
32360   Y%=ASC(MID$(E$,I%-1)):CALL OSBYTE
32370   NEXT
32380 Y%=13:CALL OSBYTE
)
)
)RUN
THIS LINE OK
Bad command in this:-
)L.30
   30 *FX0:REM M.O.S. doesn't like remarks
)30
)RUN
THIS LINE OK
Missing " in this:-
)L.40
   40  PRINT"...no trailing
)40
)RUN
THIS LINE OK
Missing ) in this:-
)L.50
   50  A$=SIN(12*(64/1234)
)50
)RUN
THIS LINE OK
Syntax error in this:-
)L.60
   60  .....etc
)
)
```

BBC BAD PROGRAM FIX

I noted with interest the tip by David Julien Waring (January) on recovery of programs which came up with the message 'bad program'.

The BBC Computer is however, very prone to corruption of the first block, and in this event it can be very annoying as the program cannot be loaded at all. To overcome this I have devised the following method to load the program, list it, and insert the missing first block again to enable it to run.

Position the tape at the commencement of the faulty program and then take it out of the recorder. Place a new tape in the recorder and then type in a program of two lines, 10 and 20, each containing the maximum number of single characters (236). 'X' is convenient.

Save this program, naming it with the name of the program you are trying to recover, then rewind the tape. Reload the program, but press 'STOP' on the cassette player the instant the first block has loaded — this must be judged by ear alone. Replace the tape with the original program tape, press 'PLAY' and allow the program to continue loading. This will not quite fool the computer, however, and on completion of loading 'Bad program' message will appear. This can then be recovered with the following modified version of Mr Julien Waring's fix. No line numbers!

A=&E00 : REPEAT X=A?3 : IF A?X=13 A=A+X : UNTIL 0 ELSE UNTIL 1 : REPEAT Z=Z+1 : UNTIL ?(A+Z)=13 : ?(A+3)=Z

Press 'RETURN' and wait for the prompt to reappear, when with luck the program should be listable. Of course the first few lines will only be 'Xs', but at least it is now capable of repair.

James R W Rye

LYNX SCREEN

One annoying fact of using personal computers on televisions is that the computer's display tends to slide off the edge of some TVs. However, if you are fortunate enough to own a Lynx, armed with the fact that it employs a 6845 VDU controller, you can move the computer display around to suit.

To change the horizontal 'hold':
Enter OUT 134,3 — then OUT 135,x (where x is a value around 65 — to choice).

To change the vertical hold:
Enter OUT 134,4 — then OUT 135,y (where y is a value around 72 — to choice).

Fiddling with the values of x and y should produce a very pleasing 'centred' screen!

These changes will withstand NEW — but not a system reset.

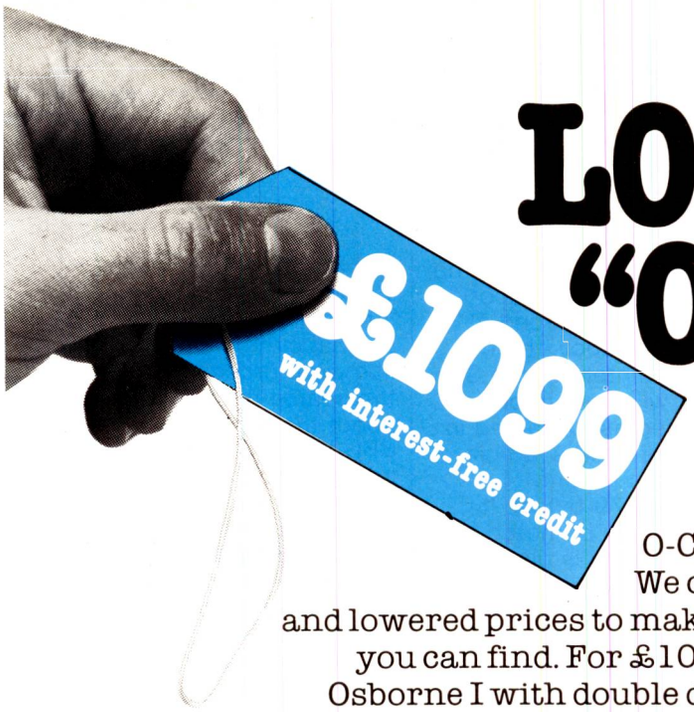
Simon Brookes

EASY KEYING

The following simple technique enormously improves the feel of the ZX81 keypad, making it easier to use and giving a degree of positive feedback to each key depression.

Selecting a key, feel for a circular recess beneath the plastic face; this recess contains the key contacts and is 1cm in diameter. Taking a ballpoint pen, carefully trace a circle on the plastic face following the inside edge of the recess and pressing just hard enough to score the plastic lightly. This causes the encircled section to rise into a small bubble on the key; you will now be able to feel the upper key contact which closes on the lower key contact with a detectable click. Repeat this procedure for all the keys. If you prefer not to mark the keypad then use a ballpoint with water soluble ink and clean it afterwards.

Simon McQuillen



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PCW 175



SHARP STRINGS

As Maurice Hawes mentioned in 'Making the Most of the MZ-80K' (*PCW* March), Sharp SP-5025 does not allow string inequality comparisons. The Basic program below POKEs into place a machine code routine of my own which overcomes this drawback.

The program as presented is written for a completely unmodified Basic SP-5025, with the main part of the routine being placed at 3DDCH (15836 decimal) onwards. If this space is occupied by a Toolkit then the routine may be placed elsewhere by altering the variable 'START' accordingly. If it is placed at 4806H or above then other pointers within SP-5025 will have to be changed as explained in Maurice Hawes' article (the main routine occupies 79 bytes). It should also be noted that a subroutine is placed within the Basic so that it *overwrites* part of the original SP-5025 string comparison routine (from 2283H to 22A4H). Before doing this overwriting make sure that any Toolkit you might be using doesn't already require this area for its own purposes (there is no clash in this respect with the Knight's Commander Toolkit). If you do move the Basic text start address to make room for the above routine you might also have to put this address into locations 1208H (low byte) and 1209H (high byte) in order to prevent the routine being wiped out on cold-starting Basic.

The routine treats 'A' as less than 'B' as less than 'C'. . . and so on. Strings are compared letter by letter as far as possible. If all letters compared are the same then the longer string is considered to be greater. Lower case letters are taken to be equal to their upper case equivalents. The routine may be altered to make all lower case letters greater than all upper case letters if required. To do this POKE 8866,201.

Alan Stevens

```
1 REM     Full string handling
2 REM
3 REM     by A Stevens
4 REM
5 REM     ********************
6 REM
10 DATA B9280D381579B1282B,CD8622282618 10B7
20 DATA 2816CD86222811,1806B72805CD8622
30 DATA 381208E604281B18,1408FEB7280FE606
40 DATA 280B180E08FEB72809,E60A2805111916
50 DATA 1803111E16CD1A18,E1CD7B23C35B22
60 DATA 47CD01,18EBCD01,18CD9E,224FEB
70 DATA CD9E22,EBB9C023,1310F1,C91ACD
80 DATA B90BE6,7FC9
90 REM
100 START=15836:HIGH=INT(START/256):LOW=START-256*HIGH
110 REM
120 REM     Main routine
130 REM
140 GOSUB 400
150 FOR J=0 TO 78
160 GOSUB 500 : POKE START+J,D
170 NEXT J
180 REM
190 REM     Comparison subroutine
200 REM
210 GOSUB 400
220 FOR J=0 TO 30
230 GOSUB 500 : POKE 8838+J,D
240 NEXT J
250 REM
260 REM     New jump addresses
270 REM
280 POKE 8805,120
290 POKE 8835,195 : POKE 8836,LOW : POKE 8837,HIGH
300 END
370 REM
380 REM     Read machine code
390 REM
400 A$="" : CODE$=""
410 FOR I=1 TO 10
420 READ A$ : CODE$=CODE$+A$
430 NEXT I
440 RETURN
470 REM
480 REM     Hex to decimal conversion
490 REM
500 HEX$=MID$(CODE$,2*J+1,2) : D=0
510 FOR K=1 TO 2
520 A=ASC(MID$(HEX$,K,1))-48 : D=D*16+A+(A>9)*7
530 NEXT K
540 RETURN
550 REM
560 REM ******************************************
```

TAB TRICK

'Another key useful in special circumstances — like word processing', is the sparse information about the TAB key in the BBC User Guide. It is useful already, for normal circumstances.

Casual, mildly inquisitive prodding of the key by the user has probably demonstrated that the cursor is advanced one space per prod but does not backspace when the DELETE key is pressed All very well and good but not much use. I found, however, that if the TAB key is used instead of the space bar the spacers are not incorporated into the program.

Take the following program beloved by the furtive Saturday morning key bashers assembled around the microcomputer counter:-

```
10 FOR I=0 TO 10
20 PRINT: "HELLO"
30 NEXT I
40 END
```

If the program is typed in using the space bar and the program length is found by the command PRINT TOP — PAGE we get 47. If the same program is now retyped using the TAB key to insert spaces the program length has shrunk to 25. When the program is listed all the spaces have disappeared. To list the program with spaces use one of the LIST0 options (see page 290 of the User Guide).

Philip Clayton

ORIC TIPS

Something all the Oric reviews that I have seen so far seem to have missed is that by pressing ESC then to escape character (these are given on page 147 of the manual) colours, flashing and double height characters can be displayed directly from the keyboard. It certainly beats fiddling with

```
PRINT CHR$(27);"escape character"
```

for experimenting with graphics.

There is also a way of overcoming the seemingly famous TAB bug. Instead of using PRINT TAB(n);A$ use POKE 617,n:PRINT A$. Location 617 holds the horizontal cursor position, which can be changed at will during program execution. If loction 617 is POKEd in immediate mode it alters nothing as the system's READY message resets the cursor to the far left.

If the GET and KEY$ commands for testing the keyboard seem a bit awkward, as they rely on the auto-repeat facility or the repeated pressing of a key, you may find location 520 of use. The value of PEEK(520) is different for each key, but it remains constant while a key is held down. Unfortunately the value of PEEK(520) is not the same as the ASCII code for the key held down, but it is easy enough to find out what it is by typing something like this:

```
X=0: REPEAT: PRINT PEEK(520): UNTIL X=1
```

and then pressing a few keys.

Andrew J Edgington



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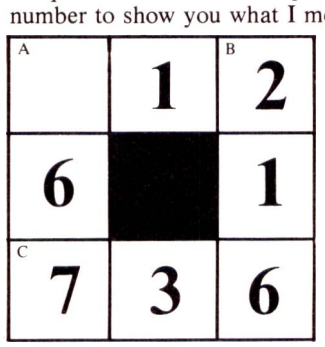
THE REALLY VERY FRIENDLY COMPUTER

CROSS-FIGURES

Philip Lewis describes how he stumbled into the world of creative cross figures nine years ago. Since then his enthusiasm has remained unabated. Here he eagerly imparts his knowledge to those mathematical freaks among us.

It was summer 1974, and I had just arrived in Malta. Browsing in the hotel's bookshop, I picked up a faded and dusty paperback called 'Cross-Figure Puzzles'. What on earth. . .? I opened the book and was transported into a miniature new world. Unfortunately, this little world was and still is sparsely populated. Colonists are very welcome and there are golden opportunities for explorers!

But before you rush to join the queue, let me tell you what cross-figures are all about. First of all, they are not to be confused with (what I call) cross-*numbers*. These you may have met in school text-books or puzzle magazines. As with (normal) crosswords, the clues in cross-numbers are *independent*. Here's a sample 3x3 cross-number to show you what I mean:

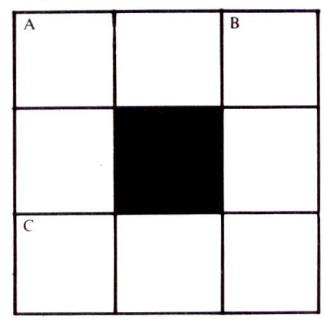


Across
A 2^9
C 592 + 609 - 465
Down
A 27x21
B 299808÷1388

In this sort of 'puzzle', you can start where you like, because the clues are independent. Cross-numbers are useful in the classroom because they look more interesting than lines of 'sums' and also because the answers are largely self-checking; for example, if your answer to A-across is wrong, then it probably won't fit with your answers to A-down and B-down. You will doubtless agree with me that cross-numbers can have little appeal to adults, except for dedicated calculator-punchers.

Now let's get on to cross-*figures*. Have you ever seen a crossword with clues like 'This is what a 5-across might give you if you asked him for a 10-down'. So you look up the clue for 5-across but only when the weather is 1-down.' And so on. Exasperating! How do you begin? The clues are *interdependent*. You have to find a way in.

Cross-figures present much the same sort of problem in the mathematical field. As the clues are interdependent, where does one start? Here's a sample 3x3 cross-figure to practise on:



Across
A C-across x 3
C Multiple of 3
Down
A A-across + 6
B C-across x 5

(Don't get confused by the letter-labelled clues. After all, if you have number-labelled clues for crosswords, it makes sense to have letter-labelled clues for cross-figures. The letters are not variables but simply labels.)

Now let's take a look at those four clues:

C-across is a multiple of 3. That's no great help. We shall need to know more about A-down or B-down first.

A-down is A-across plus 6. Here we obviously need to pin down A-across first.

A-across is three times C-across. Yes, that we could use. Cross-figures do not have 'leading zeros' any more than crosswords have 'leading blanks', so C-across must be between 100 and 333, while A-across must be between 300 and 999. This means that we could pencil in '1 2 3' in the bottom left box and '3-9' in the top left box.

But let's not be hasty. The last clue tells us that B-down is five times C-across. And we have of course spotted that B-down and C-across share their final digit. What digit, multiplied by five, produces the same final digit? 5 is the only one. Or is it? How about 0? Yes, we mustn't forget 0! So we pencil in '05' in the right box. The door is now open.

As A-across is three times C-across, which we know ends in 0 or 5, the last digit of A-across must also be 0 or 5. But 0 is impossible, because B-down cannot have a leading zero. That makes B-down 5?5. And as C-across must have a factor of 5 (5 'goes into' all numbers ending in 5), B-down (= five times C-across) has a factor of 5x5, or 25. So B-down can only be 525 or 575, because if a number has a factor of 25, the last two digits must be 00 or 25 or 50 or 75. Dividing by 5, we get C-across as 105 or 115. Ah, hah! 105 is a multiple of 3, being 3x35, and 115 is not divisible by 3. So. . . C-across is 105, and B-down must be 525. We're nearly there! A-across must be 3x105=315, and hence A-down is 315+6=321. Victory!

Incidentally, this particular cross-figure has been solved by several children in the 9-12 age group.

One day I completed a puzzle and noticed with surprise that I had not used one of the clues. That particular clue was clearly redundant.

Now, information redundance — or, rather, its absence — is an essential aspect of mathematical elegance. To illustrate this idea at its simplest level, no one grappling with a problem like 'Find the value of X when X+2=5' needs the additional information that 2x=6!

So, with this in mind, I kept a sharp lookout as I worked my way through the book and managed to eliminate a clue in several other puzzles. That whetted my appetite, and when I got to the end of the book I went back and tackled all the puzzles again with new analytical ideas. This time I succeeded in cutting out two or three clues from most of the puzzles, and on a third attempt I found at least five clues could be trimmed from the 25 to 35 clues provided.

This was all very well, but the big problem remained: how to determine the maximum number of clues which could be squeezed out of each puzzle so as to leave it in a state of perfect mathematical elegance without compromising its unique solution. It seemed that I was stuck on an exponential slope of difficulty, where the elimination of every clue made it progressively

more difficult to eliminate a further one.

In the summer of 1976 I acquired a pocket calculator and tackled the whole business again — this time with the application of elementary Information Theory. By the October of that year I had reached an average elimination level (for standard 9x9s) of 31 per cent of the given clues — not far short of the absolute maximum, I thought. (Wrong again!).

With this method I eventually reached an elimination level — mainly in the 40- 50 per cent range.

That brings us to the main purpose of this article. I had been wondering for some time whether cross-figures could be programmed, so that autumn I joined a course to study assembly code with only 200 addresses. As soon as I had acquired all the code words and run a few simple programs, I tackled the problem of programming a 4x4 cross-figure, without even knowing whether 200 addresses would be enough for the job. That turned out to mean two months' hard work, wih the final instructions just squeezing in under the 200-address limit. The cards were fed into our old IBM 1440 and out came the correct solution. My first cross-figure program was born. . .

And that was as far as I could go. I programmed another 4x4, but the language was inadequate for larger cross-figures. So the following autumn I took up Fortran and Cobol. Within a few weeks I had run successful programs for 4x4s in both languages, although it became painfully clear that using Cobol for that purpose was rather like taking a sledge-hammer to a nut! To my surprise (given that Fortran was developed for mathematical problems) Cobol was the more efficient in run-in time, even if not in terms of program-writing time!

So far so good. . . It was but a short step to writing successful programs for 9x9s. Or so I thought. . . Computers laugh at number-crunching problems involving something like 10^8 possible configurations (3x3s) and cope quite well with magnitudes of the order of 10^{12} to 10^{14} (4x4s), but even the bravest computer quails when confronted with huge numbers like 10^{60} (9x9s). My first 9x9 program drafts looked good and may well have been logically sound, but all they produced when fed into the computer was deep silence. (I had not yet cottoned on to the idea of intermediate printouts.) After appealing for help I worked out that my otherwise adequate program was due to run for 100,000 years before it got to the printout stage. . . This was a bitter blow, as the old IBM 1440 I was using obviously wasn't going to last that long!

After more hard work over a period of months and a lot of trouble with nesting limitations, I managed to reduce the prospective run time for a 9x9 program to a mere month or so. The chance of testing such a program remained nil. Then I gained access to an ICL 2903 and I hopefully rewrote my programs with some new angles. A test run, printing intermediate results, suggested a total run time of 8 to 15 hours.

Some time later I started working with programmable calculators, and devised a 3x3 (my first stab at actually compiling a cross-figure) in Basic which just fitted into the available memory. I had no time, however, to do cross-figure programs in Basic: there were more urgent matters to be considered, like four-dimentional rotating cubes, Fibonacci-type modules series, the relationship betwen infinitesimals and Cantorian transfinites in the light of probability theory.

In the last half of 1982, there were breakthroughs on several fronts. Time-absorbing subroutines were eliminated and I started measuring run time in minutes instead of hours. I am now satisfied that any further improvements *I* could make in cross-figure programming technique would be strictly marginal — unless there is a whole new strategy waiting to be discovered.

The end of the story? Not quite. During all these years, I have found very few people who had ever tackled a cross-figure. Nevertheless, I am convinced that (somewhere out there) thousands of potential enthusiasts are ready and waiting for the chance to use their computers and their brains on something more demanding and amusing than destorying alien spaceships or sorting customers into alphabetical order.

Cross-figure puzzles provide entertainment and instruction for one and all in many different ways. Is there anyone without a pathological hatred of figures who can resist the temptation to try his hand at solving a 3x3? Why, it's literally child's play!

For programming beginners, writing a successful program for a 3x3 is a quite attainable initial target. Achieve it, by whatever methods, and you have won your initiation into the Society of Cross-Figure Programmers!

Do you find 3x3s too easy? Then, there are many different sorts of 4x4s on which you can develop your skills in both 'manual solutions' and 'programmed solutions'.

I also hope that professional mathematicians and experienced programmers will see in cross-figures a fertile field for investigation: Ultimate Elegance proofs; Information Theory applications; and much more.

The 3x3 at the beginning of this article makes a tasty little *hors d'oeuvre* for hungry programmers. When you've got that one under your belt, try the puzzles printed below.

You will find that cross-figures can be programmed in several ways. I think I have tried most of the possible approaches under my general strategy, but you may come up with a new approach or even win fame and fortune by developing a completely new strategy!

For the sake of standardisation and comparability, I suggest the following 'ground rules':

1) Lower and upper limits of grid numbers may be determined by inspection of the grid. A three-digit number, for example, obviously lies betwen 100 and 999.

2) In order to remove subtraction, division and root operators, clues may be 'switched around' before being put into the program. In algebraic terms,

$a = b - c$ becomes $b = a + c$

$a = b / c$ becomes $b = ac$

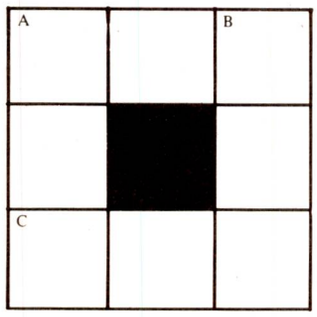
$a = \sqrt{b}$ becomes $b = a^2$

3) The clues, taken as a whole, may be analysed in order to determine which of the grid numbers are 'primary' and which are 'derivative', in terms of ascending order. In the clue 'A-down is seven times C-across', for example, C-across is primary and A-down is derivative.

4) Apart from the above, *no mathematical calculations or deductions are to be made outside the actual program.*

5) The program must not only find a solution but also show that there is only *one* solution or (horrors!) show that the compiler has made a mistake and there is more than one solution.

Do any of these cross-figure puzzles have redundant clues? If so, what are they?



Across

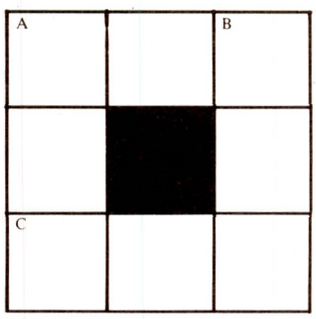
A B-down minus A-down

C Seven times A-down

Down

A Prime number

B Square number



Across

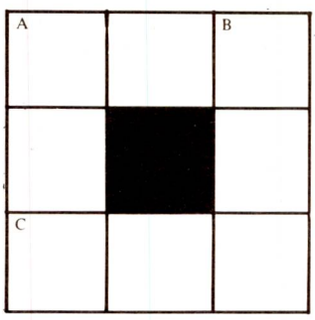
A Three consecutive digits in ascending order

C Three consecutive digits in descending order

Down

A Square of prime number

B Three identical digits



Across

A square of first two digits of B-down

C Square of last two digits of A-down

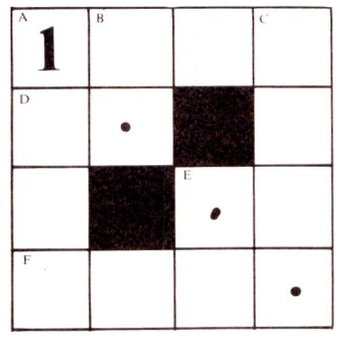
Down

A Sum of digits is 12

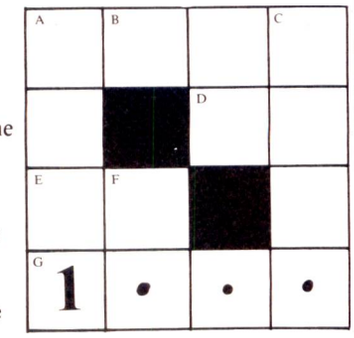
B Prime number

CROSS-FIGURES

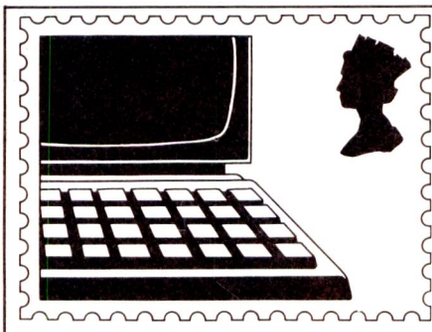
Across
A (Four) Digits total 19
F Square of E-across
Down
A D-across x B-down
C Twice A-across
E See below (*if* you must!)
First theatre in England opened in year 1. . . (see dotted squares). Puzzle can be solved without the extra clue: use a calculator!
E-down is multiple of 11.



Across
A G-across x 3
D Square number
E Prime number
G Bismarck appointed Prime Minister of Prussia.
Down
A Digits total 18
B One more than E-across
C E-across x B-down
F G-across ÷ D-across
Six of the eight numbers in the puzzle have a common factor.
Of the nine clues, how many are redundant?



PS Solutions will be printed in the July issue.



COMMUNICATIONS

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

Babbage rules OK

As my original article was concerned with Charles Babbage only, I feel that I must reply to L E Weavers appraisal of Ada Lovelace (March 1983 Communications).

The role of Ada Lovelace in the development of the Analytical Engine has until recently been over emphasised. In 1840, Babbage travelled to Turin to present a series of seminars on his Analytical Engine to a group of Italian scientists. It was his intention that one of them would publish an account of the machine. This role was performed by a young military engineer, L F Menabrea, who published his account in 1842.

The account was subsequently translated from French into English by Ada Lovelace (she became interested in the Analytical Engine in 1841). Under the consultation and guidance of Babbage, extensive notes were added to the translation. The translation and notes formed the most important paper in the history of computing predating the modern era.

It was in direct consequence of this, that Ada Lovelace's role in the development of the Analytical Engine has been over estimated. The programs she discusses were developed by Babbage (by as much as 5 years beforehand), and taken to Turin.

Ada Lovelace did, however, perform her role as a publicist extremely well indeed, but her influence on the development was not as much as had been supposed.

It is worth noting that the naming of the (new!) computer language by the United States Department of Defence was performed before the true role of Ada Lovelace was uncovered.

For those interested, there is a major reprint series currently in progress of major works in the history of computing, published by the Charles Babbage Institute in the United States. One of these is *Babbage's Calculating Engines*, a collection of Charles Babbage's works assembled by his son, Major General H P Babbage, which was published originally in a limited edition in 1889.

Queries concerning the series should be directed to the publishers – Tomash Publishers, PO BOX 49613, Los Angeles, California 90049.

N Holder, Coventry

Satellite tracking

I refer to the letter written by Mr John Evans in your feature 'Communications' in the April issue of *PCW*, wherein he complains that most micros leave out the inverse trigonometric functions Arc sine and Arc cos. Moreover, in order to remedy this apparent deficiency, he has kindly supplied a very crude iterative subroutine which calculates Arc sine.

I am surprised that he has not delved more deeply into advanced mathematics books since in them he would find the necessary formulae for Arc sine and Arc cos.

The following formulae show the necessary relationships:-

ARC SINE(X) = ATN(X/SQR(ABS(1 − X⌒2)))
ARC COS(X) = ATN(SQR(ABS(1 − X⌒2))/X)

The complete solution for Arc tan (and hence for Arc cos and Arc sine) can be performed with the following program:

```
1000 REM SUBROUTINE FOR ARC TAN
1010 IF X1 > 0 THEN THETA = 180 × ATN(Y1/X1)/3. 14159
1020 IF X1 < 0 AND Y1 > 0 THEN THETA = 180 × ATN(Y1/X1)/3. 14159 + 180
1030 IF X1 < 0 AND Y1 < 0 THEN THETA = 180 × ATN(Y1/X1)/3. 14159 − 180
1040 IF ABS(X1) < 0.000001 AND ABS(Y1) < 0.000001 THEN THETA = 0
1050 IF ABS(X1) < 0.000001 AND Y1 > 0 THEN THETA = 90
1060 IF ABS(X1) < 0.000001 AND Y1 < 0 THEN THETA = −90
1070 RETURN
```

where in this subroutine X1 = SQR(1 − X⌒2) and Y1 = X for Arc sine and X1 = X and Y1 = SQR(ABS(1 − X⌒2) for Arc cos

Thus programs for finding Arc cos and Arc sine are as follows (using the above subroutine):-

If N is the sine of THETA then:-

```
10 Y1 = N:X1 = SQR(ABS(1 − N⌒2))
20 GOSUB 1000
30 PRINT THETA
```

If M is the cosine of THETA then:-

```
10 Y1 = SQR (ABS(1 − M⌒2)):X1 = M
30 PRINT THETA
```

The main problems with Mr Evans procedures are that they take too long to perform and that there is no differentiation between, say, sine (45 deg) and sine (125 deg)

Ian Pardington, Twickenham, Middlesex

Tough contender

Having just read your report on the 'LSI-M4' in the April edition of *PCW* by Jane Bird, I was rather disturbed to find that you did not like the packaging of the system. I use the company's 'LSI-M3' a lot

and find that the keyboard is just right, if used in the correct environment, eg, on a desk. Incidentally, the break key is also user definable!

I personally am quite pleased about the 'excessively thick and strong case' as on one Sunday morning I was busily programming away when I heard a creaking from above.

On looking to see where the noise was coming from, I was just in time to see the shelf above me holding about three quarters of a ton of paper breaking away from the ceiling! I pushed myself away from the table only to see the M3 being covered by the falling paper; the keyboard shot across the room; the M3 went *beep*. I thought all was lost.

After some ten to fifteen minutes of removing the paper from where I thought the machine should have been, I saw my first glimpses of the M3 – it was still running!

On revealing the M3 further, locating and plugging in the keyboard, I did a couple of routine checks. Everything was in order. That was last November; this letter was written on the M3 using Wordstar which is very easy to use with the aid of all the function keys.

M I Cohen, Northolt, Middlesex

We used ours as a stepladder – Ed.

Camputer's advertising error

I am writing to draw your attention to a very misleading claim being made by Camputers Limited in their advertising of the Lynx microcomputer.

I recently bought a Lynx from a shop in the Spectrum chain. One of the main reasons for my choice of machine was the RS232 serial port as standard. This serial port is described in the Lynx sales brochure, and indeed mentioned in Camputer's full page advertisement in the May issue of *PCW*. The Lynx manual also outlines the use of LPRINT and LLIST when using an RS232 printer. Unfortunately, the Lynx does not have an RS232 port. There is a socket on the back of the machine marked 'serial', but it will not drive a serial printer, or any other RS232 peripheral.

After a telephone call to Camputers, I gather there is no intention of rectifying this omission. I have therefore returned my machine and obtained a refund, and hope that anyone else who has been misled in this way will do likewise.

Christopher Nelms, Godalming, Surrey

Camputers regrets its misleading advertising, and will be using the phrase 'serial port' in future. The company is supplying a special lead and software support for RS232 with commands listed in the newsletter. – Ed.

Oric-1 ostracised

I have just read your review of the Oric-1 and find that mine has exactly the same bugs as yours had.

My sad tale began last October, when I sent in my order for the Oric-1 48k. I expected to receive it around Christmas, in time to code up my 'A' level project, but I received a letter saying I could have my money back or wait a while longer. With a promise of a Forth language (which I still have not had), I decided to wait. My account was debited just before Christmas. They had stated in a letter that my account would not be debited until a computer was ready for dispatch. I waited until the middle of January and nothing came, so I wrote to them explaining about my project and asking if I could have my money back.

Instead I received my first Oric-1 which seems to have been a cross between your first two review models. At first, because of the small book I received, I wondered if I was trying to use it incorrectly. I rang several times and eventually I was put through to Cambridge. They told me the computer was faulty, and to send it to the service department. I sent it back with a letter asking them to replace it, or refund my money within a week. After two weeks with no reply, I wrote to Ascot saying that if nothing was done, I would take legal action.

I received my current computer on 11 February, and was thrilled to have a computer that seemed to work properly. Then, I found the faults mentioned in your review. In addition, the screen jumped around when a sound command was used.

So, now I know about the faults, and I assume the computer has an EPROM instead of the ROM which I thought it had.

Edward Kent, Burton on Trent, Staffs

PS I have lost faith in this company, not due to the product, but the atrocious service I received.

The agony and the ecstasy

As an avid reader and subscriber to your esteemed journal, I feel entitled to offer helpful criticism. Your indexing method is positively lousy! This is most surprising since you and your contributors frequently and correctly rebuke computer manufacturers for their poor documentation. Furthermore, your clever little 'Goto' instructions in the middle of articles often direct me to the wrong page. I suggest that you replace the entire editorial board by a reliable (probably Japanese) microchip.

Why all the fuss? Because I have just spent 2 hours trying to trace that wonderful article by Bob Huckle on 'How to make Epson, Wordstar and Osborne sing and dance'. Don't exhaust yourself looking it up, it's in the January 1983 issue on page 145. Perhaps you could drag him out of hibernation (if you haven't lost his address) and ask him to teach us how to use some of the graphic facilities on the Epson. Yes, I know the excellent Epson manual shows you how to do this using Basic, but I want to generate and use some Greek characters (alpha, beta, etc) in my Wordstar documents.

As a scientist (of sorts) I frequently use these characters and have tried to produce them by superimposing standard characters. Thus, an upper and lower case 'p' gives a passable beta – thus ß. I can make a poor imitation 'micron' by subscripting a slash before the letter 'u' – and thus '/u'. However, I cannot make an alpha nor sigma. This could be the start of a new series of articles on useful graphics in place of infantile computer games. Perhaps one of your intelligent readers has already cracked the problem?

D C Weinkove, Stockport

PS Many months ago I submitted an amusing (I laughed) article on computers. Since then, I won my wonderful Osborne in a competition in the magazine *Which Micro* (bless them). I now wish to change the jokes and send the nonsense elsewhere. OK? Yes, I know you have lost the contribution! *Anyone got any ideas? – Ed*

Revenge is sweet

I am writing to warn readers of the hazards involved when trying to sell software through professional software companies.

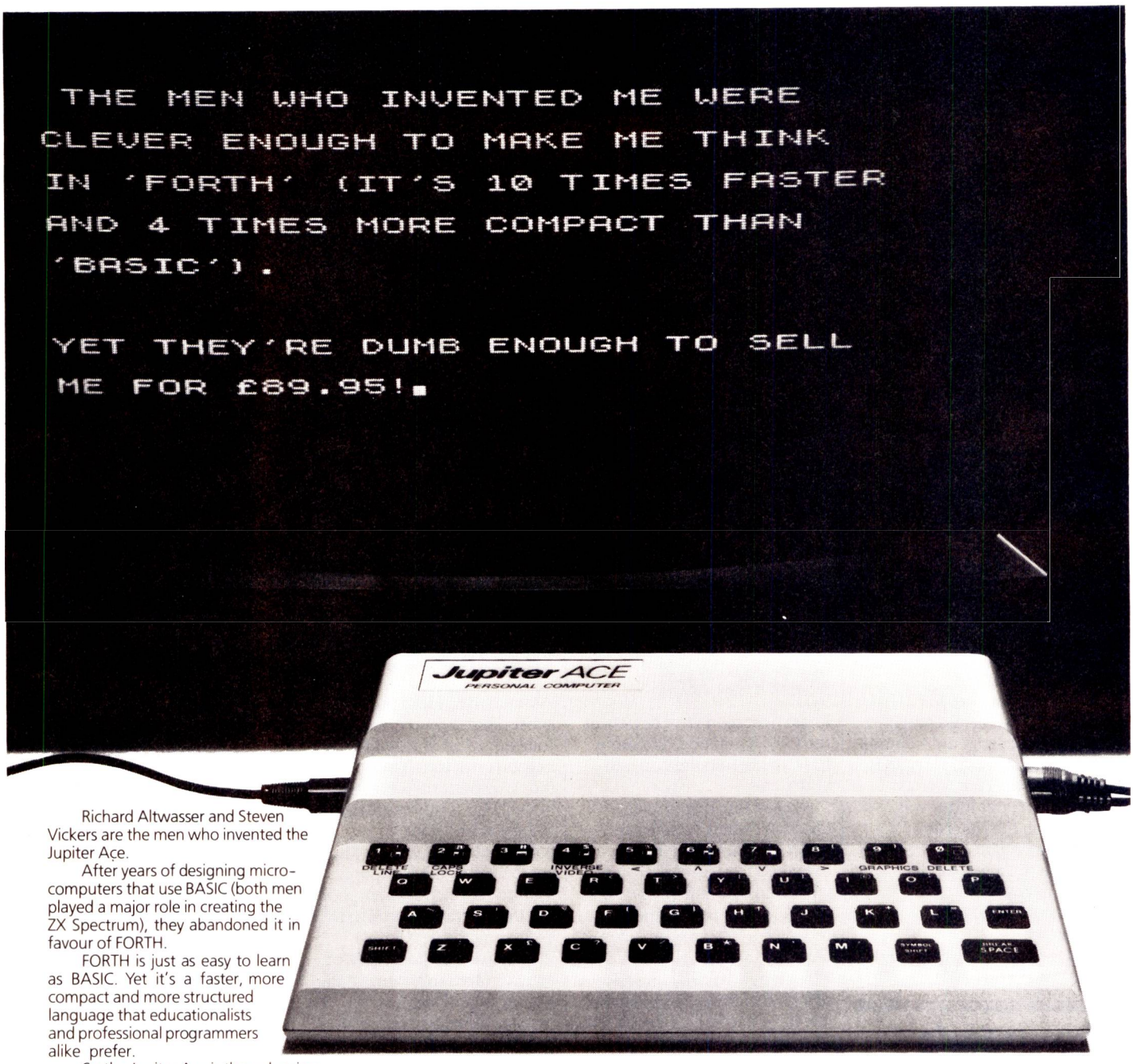
My problem started in September 1982 when, at the Personal Computer World Show, I approached a representative of the Bug Byte company with an item of software which I considered had a potential market.

Having given the representative a cassette containing the program and an operating manual, he said that Bug Byte would be in touch with me within a fortnight (ie, at the beginning of October).

However, I did not hear from them, and so at the beginning of December I wrote to the company enquiring about what was happening. No reply was received from Bug Byte.

A telephone call was made to the company. The person who answered did not know the program and said that he would follow it up. On telephoning a few days later, he said that he had not been able to find the program. After further telephone calls Bug Byte was going to 'put something in the post' (I don't know what, since they said they had lost my program!). However, nothing appeared.

This was in January.



Richard Altwasser and Steven Vickers are the men who invented the Jupiter Ace.

After years of designing micro-computers that use BASIC (both men played a major role in creating the ZX Spectrum), they abandoned it in favour of FORTH.

FORTH is just as easy to learn as BASIC. Yet it's a faster, more compact and more structured language that educationalists and professional programmers alike prefer.

So the Jupiter Ace is the only micro-computer you can buy that is designed around FORTH.

Using it, there's little fear of accidentally 'crashing' programs halfway through and having to start all over again (a common fault with BASIC). The Jupiter Ace's comprehensive error checking sees to that.

The Jupiter Ace has a full-size keyboard, high resolution graphics, sound, floating point arithmetic, a fast, reliable cassette interface, 3K of RAM and a full 12 month warranty.

You get all that for £89.95. Plus a mains adaptor, all the leads needed to connect most cassette recorders and T.V.'s, a software catalogue (35 cassettes available, soon to be 50), the Jupiter Ace manual and a free demonstration cassette of 5 programs

The Jupiter Ace manual is a complete introduction to personal computing and a simple-to-follow course in FORTH, from first principles to confident programming.

Plug-on 16K and 48K memory expansions are also available, at very competitive prices. (There'll be a plug-on printer interface available soon, too.)

It'll take you no time at all to realise how clever Richard and Steven were to design the Jupiter Ace around FORTH. And even less time to realise what a silly price £89.95 is to charge for it.

Technical Information

Hardware
Z80A; 8K ROM; 3K RAM.

Keyboard
40 moving keys; auto repeat; Caps Lock.

Screen
Memory mapped 32 col x 24 line flicker-free display upper and lower case ascii characters.

Graphics
High resolution 256 x 192 pixel user defined characters.

Sound
Internal loudspeaker may be programmed for entire audio spectrum.

Cassette
Programs and data in compact dictionary format may be saved, verified, loaded and merged. All tape files are named. Running at 1500 baud.

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Contains D.C. power rails and full Z80 Address, data and control signals. Can connect extra memory peripherals.

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Nothing more was done for a while, but at the end of February, Bug Byte was again telephoned to tell them that nothing had been received, and Mr Tony Milner promised to put something in the post the next day. However, again nothing arrived.

Since then another letter has been written to Bug Byte stating that if no reply was received, then letters would be sent to a number of computing magazines.

Perhaps selling software through Bug Byte is in their own words 'from difficult to suicidal'.

S J Harris, Bedford

Acorn replies

We are in regular contact with Morten Christiansen (*PCW* May 1983) and have already replied to him regarding his questions on 8in disk drives support.

The BBC micro is a very flexible system and has the inherent capability of supporting 8in disk drives.

The market place is, however, moving increasingly to the 5¼in format and we have chosen to give this priority. The Z80 2nd professor (ANCOX) will include an excellent package of CP/M software on 5¼in disks at a planned price of £295. We also plan for key software houses to make additional CP/M software available in business format.

Rest assured that we intend to fully support serious business applications on the BBC Micro Computer.

D J Bell, Acorn Computers, Cambridge

Keyboard Krisis

In your reply to the letter from S Douglas concerning alternative keyboards for the ZX Spectrum, you mentioned two that have no space bars.

Dean Electronics makes a keyboard that not only has a full-sized space bar and the break space key, but is also fitted with six spare keys. Using fine gauge wire, these can be connected to other keys, so that you can have conveniently placed duplicates of functions such as 'caps', 'lock' and 'symbol shift'.

As far as I know the keyboard is only available from Buffer Micro Shop, 310 Streatham High Rd, London SW16. Tel 01-769 2887. The price is £49.50, and although the firm is a retail business it will accept mail order (if you send £51.50 to cover P&P).

K J Brickwood, London

Customer relations

We were sorry to see that Mr Ferguson had to resort to a letter to *PCW* (March), having tried to contact us on three separate occasions.

It is true to say that the tremendous popularity of the BBC Micro and the general success of Acorn had caused our communications with some customers to become stretched to the full.

This is precisely why we have established our Customer Services Centre, which is run under my direction. A new 10-line telephone system has been ordered specifically for customer enquiries. This installation will be in addition to the existing 10-line Acorn exchange – and when it arrives we will be fully operational. We have significantly increased the number of staff in the Customer Services team and will be dealing promptly with all queries like Mr Ferguson's, and in his particular case we have already written to him and answered his questions.

M J Bicknell, Customer Services Manager, Acorn Computers.

Pat on the back

I applaud the recent moves in the editorial of this and other magazines to expose some of the blatant techniques used to market products that are by no stretch of the imagination ready. This is obviously a step in the right direction, but would it not be a giant leap in the right direction if this and other magazines refused to publish some of the more obvious transgressions?

Iain M Worthington, Nottingham

We do, or rather, we don't – Ed.

TOMORROW'S OFFICE

continued from page 156

Documentation

Tomorrow's Office has two manuals — a traditional reference manual and a Training Guide. The Training Guide is good and clear, and has *an index* and some complete examples — unfortunately in my copy most of the printout from these was badly printed and very hard to read. The Reference Manual is better presented than most, with page layout and emphasis used to good effect. It does, though, take the common completely solution-oriented approach. This, combined with the more usual lack of an index, makes it quite hard to find particular pieces of information of the 'I know I've read that somewhere' kind. The confusion in Tomorrow's Office between the use of the word 'index' for a sorted list and for a selected list made this finding process just a little harder still.

Costs

The package costs £695, and runs on the Sirius under MS-DOS; it is a development of a Commodore PET package, the Administrator, which is in widespread use. The purchase price includes all updates of the life of the package, and support via the telephone 'hot-line' at Stage One's headquarters in Poole. The package will run quite happily on the single-sided disk version of a hard disk. At present Tomorrow's Office is a single-user system; I understand that the originators are expecting to provide a multi-user version once the networking scene on the Sirius has become more stable.

Conclusion

Tomorrow's Office, judged as a data management package, provides a good range of facilities for an application where interactive access to the data is through the primary key field. With this kind of data, you can extract, order, manipulate and maintain your data with a fair degree of flexibility and ease of use. It also provides a master/transaction file facility; the ability to have one master record associated with any number of transactions gives the user a virtually unlimited record size. So, for an application where primary key access is the norm, and particularly where the data is of the master/transaction record type, Tomorrow's Office would be a very good buy, particularly as the package makes excellent use of the special features of the Sirius, the prompting and 'help' are well provided, and the facilities for printing reports are very good.

However, for applications with less well-structured data, the package might not be quite so appropriate. The restriction to 484 characters for a master record will often mean that the user must use two or more transaction records per master to get all the information in (given the accompanying limit of 240 for master and 244 for transaction records where both are needed). The restriction to a single screen-worth for display might mean that not all the data could be displayed at once. Further, the restrictions on access by other than the primary key could also cause problems in some applications, again where the data is less highly structured, particularly as the secondary indexes are not automatically kept up-to-date when data is amended or added. I was also rather disappointed that the facilities for providing users with special menus, and for storing commands in a file — while excellent as far as they went — did not include any form of conditional execution.

So once again, this is very much a 'horses for courses' situation. Tomorrow's Office is a well thought out package with many facilities and on the whole a very good user image. If you have, or are thinking of buying, a Sirius, you would do well to give the package serious consideration, since for the right kinds of application it should prove a very good buy for the data management. But it is not, despite its name, an 'integrated' package, and for word processing and 'calc' facilities you would have to use Tomorrow's Office in conjunction with other software.

END

CHECKOUT

THE FINANCIAL DIRECTOR

Keen to accept the challenge to demonstrate the Financial Director's user-friendliness, Ian Griffiths of Accountancy Age was up from his corner before the bell . . .

In the latter part of last year I was asked to attend a small press conference held by Financial Director Software to launch its new suite of accounting programs.

The company's claims for its software were, it seemed, grandiose. The package was said to be so user-friendly that a bookkeeper or accountant with absolutely no computer experience at all could fire it up and use it straight away with no trouble.

Everybody claims that for their own software, said I. But everyone knows that user-friendly software is just as likely to bite your head off as to work properly for you. Financial Director's Managing Director Stephen Brookner insisted that using the Financial Director was, in principle, like using manual accounting books only much easier, because it took the long, hard work out of the process.

Being an out-and-out cynic I couldn't refrain from declaring, in MicroScope's issue seven, that the Financial Director might be good, but that only time and real, unbiased feedback would prove it.

This observation did not make me popular. Stephen Brookner — as our reviewer, Ian Griffiths of Accountancy Age, also notes — was not too pleased with me.

In December when he read my original article he rang me and issued a challenge: 'Find an accountant with no computer knowledge and he can prove its simplicity.'

Computer experts, according to Bryan Horton, Brookner's partner, have said the system is 'insultingly protective'. That for a start led me to think I was maybe being a little too harsh. Those words simply mean that error checking on input is stringent. And although this appears time consuming, in accounting it is more time-economical to get everything right from the beginning.

Ian has given the prices and most of the technical details necessary in this review. It was surprising to find that Financial Director Software's own books are kept on the package, running on a Millbank System 10 and, apparently, it runs very well on that machine. It is this computer which is used in the review which follows.

The Financial Director is now sold through 90 outlets nationwide. Each dealer is treated to a two-day, all expenses paid, intensive course in the use and sale of the package and basic bookkeeping. A diploma is awarded to the dealer at the end of the course. Financial Director is hoping to take on more dealers in future.

Maggie Burton

Bookkeepers beware!

Stephen Brookner was not a happy man. Somebody had voiced doubts about the Financial Director bookkeeping and accounting package he had helped develop and he wanted to put the record straight. He issued the challenge: 'Find me an accountant who has no computer knowledge and let him prove how simple the package is.'

Brookner was rightly confident. Financial Director is a very simple package to use. It is also unnervingly well versed in complex yet fundamental principles of accountancy. And it is this combination which should secure its place in the field of accountancy software for some time to come.

One of the central concepts underlying the Financial Director is that it is a package which is replacing a bookkeeper and indeed the books of account themselves. It therefore incorporates all the principles and skills of bookkeeping and, at the same time, builds in safeguards which prevent the user from making an entry which the bookkeeper would not. Brookner claims that 70 per cent of the program is devoted to preventing simple accounting errors.

It is perhaps an unusual package in that it was developed by taking accounting principles as a base and then building upwards to create a product which could be used in a computer, rather than by adapting computer wizardry to produce a set of accounts.

All this became clear after some time using the Financial Director, but actually getting started was an awesome prospect, particularly for a man who had spent four years avoiding any contact with computers and resisting all attempts by one of the big internatioanl firms of accountants to allay his inherent fear of newfangled technology. But once the computer itself was safely installed and the printer connected up, there was really no excuse for further delay. Or was there? It seems there was, because this is the crucial time to sit down and read the manual.

Fortunately the manuals are not too critical with the Financial Director and you can simply leap in and start bashing away at the keyboards. A glance through the manual, however, gives a much clearer idea of what the package can do for you, and how you can set about the task of utilising the functions you need most efficiently.

Functions

The Financial Director offers seven broad functions: cash book, journal, bought ledger, nominal ledger, sales ledger, management accounts and budgets. This is more than adequate for the size of business for which the package is intended.

Setting up the books of account is surprisingly simple. This is, of course, a crucial stage for the user with little accounting knowledge or training. The Financial Director is aimed at taking the drudgery out of day to day bookkeeping — it is not intended to replace the expert financial advice which all businesses require. You are well advised to seek the assistance of your financial adviser if you have any doubts about the type of information needed, the number of accounts or the transfer of balances from a manual system. Once the books have been created the system virtually runs itself, and will produce the financial information and leave an audit trail to satisfy your accountant's needs.

Using the system

The system leads you through the start-up procedures slowly and surely. At almost every stage you are asked to confirm what you have input is correct. Once details about your company — such as name and VAT registration number — have been registered, you then move on to the creation of ledger accounts. If you have the more sophisticated Financial Director II you can also include details of departments.

For the computer novice this user friendliness is a great advantage. Simple choices and simple instructions given in plain English make it a pleasure to deal with, certainly in the early stages of acquaintance. There is the danger, however, that what is helpful and almost essential in the beginning could prove to be a little tedious and time

consuming as the user's familiarity improves.

The argument against this is, as you process various transactions, the time taken to turn a cheque stub or pluck another invoice from the file will compensate for the Financial Director's occasional tardiness. The argument cannot really be used, however, when you are moving from one operation to another. It was a little tiresome, for instance, when wanting to access the bought ledger to have to go through a series of questions and answers from the main management accounts disk before being allowed to remove that disk and replace it with the bought ledger disk.

As with many packages it is a lot easier to get into a function than it is to get out. However, this is infinitely more preferable to allowing inaccurate accounting to creep in.

A more detailed examination of the operations offered by the Financial Director will give a clearer indication of its value to the businessman.

The cash book is the inevitable starting point for any business and the Financial Director recognises this. All cash transactions can be entered, analysed and automatically posted to the nominal ledger. It also offers the additional and valuable facility of setting up standing order payments for automatic posting on due dates — something the traditional bookkeeper often overlooks. It thus allows the current bank balance to be displayed at any time, and a full cash book listing can be requested whenever you want.

The nominal ledger can also be listed at any time either in full or simply for selected accounts. The listing gives full details of each transaction and also indicates accruals and prepayments at the end of each relevant account. This accrual/prepayments facility is again a bonus, since it allows a much clearer picture of the company's performance to be created. However, as the facility is again a reflection of the traditional double entry bookkeeping of the accountant, you are well advised to consult your accountant before overindulging in creative accounting.

The Journal is the age-old vehicle by which the accountant corrects his errors. The logic behind it is to leave a full explanation of the error, be it a misposting or a misallocation, to show how the error has been corrected and, above all, to ensure that the hallowed principle of double entry is not abused. Following these principles, the Financial Director's journal facility will allow errors to be corrected — but only through a balancing journal entry and certainly not through the cash book. All journal entries are printed out to allow the audit trail to be preserved.



The management accounts include trial balance, balance sheet and profit and loss account. If the budget facility has been used, the appropriate budget figures will be included together with the variance between budget and actual. The management accounts can be produced at the end of any accounting period.

The bought ledger section of the Financial Director provides a comprehensive compilation of all the data necessary to run this essential part of any business. The bought ledger allows full details of the supplier to be retained, together with complete details of transactions, VAT, the discount which might be available to you, the due date for payment and date actually paid. Postings to the nominal ledger are made when invoices are entered. Print-outs of the purchase day book and payment journal are provided as another contribution to the extensive audit trail which the Financial Director offers. Other print-out options include a complete or individual detailed supplier ledger account listing, remittance advices, due date and aged balance reports and others which are necessary for control of the bought ledger. Cheque printing is also available as an option.

The sales ledger function is equally comprehensive in the details it can retain of a business's customers. Traditional details are incorporated with details of credit terms, normal cash discount balance owing and credit limits. Full transaction details are provided including VAT, date due, discount available and payment received. As with the bought ledger function, a sales day book and receipts journal are automatically printed after each entry session to allow the audit trail to be preserved.

The Financial Director allows instant enquiries to individual accounts and this is supported by the numerous print-outs available, which include a listing of customer accounts, individually or in total, as well as an aged debtor report — an essential element of tight credit control. The report highlights overdue balances and accounts which have exceeded their credit limits, and it can be printed for any specified date. The sales ledger function will also provide customer statements complete with detachable remittance slips.

The budgeting function of the Financial Director is particularly useful and will perform a number of tasks which will aid the running of a business. It includes the facility to prepare budgeted profit and loss account, balance sheet and even a source and application of funds' statement — a particularly useful document. Calculation of stocks, trade debtors and creditors and VAT balances is automatic. Budget figures can be entered individually, by automatic period allocation, as a percentage of another or by 13 weekly groupings. The budget figures can be varied to allow the user to assess outcomes under differing conditions. This speeds up this essential technique and will encourage more use to be made of it. The calculation of profit and cash balance by period is automatic and the budgets

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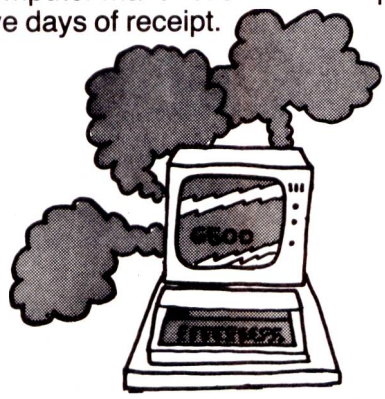

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Selling the outside is one thing . . . knowing the inside is something else.

The IBM Personal Computer is a very special micro. Here is a machine of technical excellence – a standard which others will be measured against. It's not surprising that such a product demands professional sales and service back-up.

Zynar is well established at the forefront of personal computing. Our network systems lead the field in Europe and the USA – our design group networked the Personal Computer even before its UK debut. We are professionals, having worked for many years in the computing and 'chip' industries.

Zynar will help you optimize the easy-to-use hardware and lead you to the best software solution: tailored, off-the-shelf, simple or sophisticated.

The Personal Computer has been worth waiting for. You will know it. IBM knows it. And we know it – inside-out.

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THE FINANCIAL DIRECTOR

themselves will be incorporated in the monthly management accounts print-out.

Flexibility

At this stage it is perhaps worth mentioning that there are two versions of the Financial Director; I and II. Financial Director II — which is the version under review — is an extension of the basic package and is more suited to the larger business. It offers the ability to operate more than one company from the same software, and allows a departmental or branch analysis for nominal ledger accounts within the profit and loss range. There is an option of 12 or 13 accounting periods and budgets or management accounts can be printed by department or account number, in details or summary format. It also allows the user to allocate his own account numbering system within the nominal ledger, with up to 800 individual nominal ledger open accounts.

The range of services which the Financial Director offers is, therefore, more than adequate for most small to medium-sized businesses. One notable exception is the lack of sales invoicing and stock control. The production of sales invoices is a tedious process and one where great time savings can be made. The Financial Director is, however, essentially a bookkeeping package and steers clear of this side of the business. This is not necessarily a weakness in the package. It sets out to provide a bookkeeping system based on the principles of double entry and does just that!

Expert advice

In terms of the practicalities of operating the package and utilising its services, it posed no major problems. However, it is very important to take expert financial advice in order to get the most out of your Financial Director.

The budgeting function, in particular, will be wasted if you do not appreciate exactly what you want from it. Used properly it can be a most useful tool for the manager to monitor his business — but a little learning is a dangerous thing and it would be quite easy to get bogged down trying to establish what you really want to do.

Setting up opening balances again will require a degree of accountancy expertise. The package will not operate if there is a non-balancing trial balance, and a failure to appreciate any error you have made will be most frustrating. It is a pity that the Financial Director does not allow you to make corrections to the trial balance without going through the process of printing out all the balances.

It is most annoying to wait patiently for the printer to spew out the balances, only for the computer's screen to inform you that the trial balance does not actually balance. The process has to be repeated following what you hope is the proper correction. It would be more helpful to be informed of this type of error at an earlier stage.

But credit to Financial Director: it is a very polite package and is most gracious when it tells you what a buffoon you have been.

User friendly...

Using the cash book is a simple process and the analysis which the Financial Director provides is as much as, if not more than, the traditional manual cash book. Details of the transaction are clear to see and the debtors and creditors analysis is useful to have. As mentioned earlier, the automatic inclusion of standing orders in the cash book ensures that these transactions are not overlooked, and permits an accurate cash balance to be produced.

The creation and deletion of files on both the bought and sales ledger posed no difficulties. The package is designed to lead the user very simply through the system and the instructions are easy to follow. The production of sales and purchase day books allows ample analysis of transactions. But if the Financial Director does not produce invoices, there can be no complaints about customer statements which give details of the month's transactions, an ageing of the oustanding amounts and analysis of how the balance is made up.

The journal is simple to operate and built-in safeguards prevent any misuse and ensure that the all-important audit trail is preserved.

The standard of the accounts which the Financial Director produces is to be commended. Easy to read and sensibly laid out, combined with the inclusion of gross and net trading margins, they allow the business manager to obtain a clear assessment of how the company has performed.

In summary, the Financial Director achieves its objectives admirably. It is by no means a sophisticated gadget on which to perform all manner of weird and wonderful calculations. It is, however, a simple, honest, solidly-based aid to the business manager. Its simplicity should not be allowed to detract from the package. To gain the most from the Financial Director, it is important to have an awareness of the underlying accounting principles and techniques which provide the foundation on which the package is built. The appreciation of accountancy is perhaps more important than a knowledge of computers — a point which is perhaps overlooked too often.

...but slow

The one criticism which does arise is the apparent slowness of the package once a degree of familiarity has been achieved. The easy-to-answer and follow questions (which are a marvel at the outset) always have to be answered, but perhaps this frustration is justified if it avoids complacency on the user's part.

The Financial Director is described by Brookner as the 'accountant in a briefcase' and, indeed, this is what the disk is packed in. It also comes complete with a cassette tape which will certainly assist when starting out, and when browsing through the manual which has been recently updated.

The package will be suitable for most small and medium-sized businesses which require basic accounting records. It could also be used quite successfully by professional firms of accountants or solicitors which need to keep a number of accounts on behalf of clients.

It would seem then that Brookner's challenge was based on a little more than pure bravado. The Financial Director is indeed a staggeringly simple package to operate. Its user-friendliness stretches to saying goodbye when you switch off and it poses no fears for the uninitiated in the computer world. The information it can provide, with regard to the company's cash position, money owed and owing, profitability, long-term potential and cash requirements, is enough to satisfy many budding businessmen who need that information but don't always have the time to collect it.

For a man who had dutifully avoided any contact with computers, the Financial Director turned out to be a great place to work.

System capacity

The Financial Director can be supplied for use with any computer capable of functioning under the CP/M, MS-DOS or PCOS Operating System with a minimum of 64k memory. Speed of operation and number of disks depend upon the disk storage available. The maximum quantities of records of each type permitted by the standard system are as follows:

Supplier accounts	1500
Open purchase invoices	4000
Customer accounts	1500
Open sales invoices	4000
Active nominal ledger transactions	2000
Active day book transactions	unlimited

The user can select any combination of maximum data within the limits provided disk storage is adequate. Selections in excess of available disk storage will be rejected by the system at initial set up.

Prices

	Financial Director I	Financial Director II
Individual prices excluding VAT	£	£
Bought ledger	425	425
Sales ledger	425	425
Cash book and management accounts	600	600
Budgets	450	450
All the above excluding budgets	995	1295
All the above	1295	1595

The prices are correct at the time of writing. The all-inclusive prices quoted above only apply if all the appropriate modules are purchased at the same time. Additional modules purchased subsequently are at the individually quoted prices.

Further information from *Stephen Brookner, The Financial Director Software, Asphalte House, Palace Street, London SW1, tel 01-828 4377.*

YANKEE DOODLES

Sol Libes sends his first dispatch of news and gossip from Stateside.



Random rumours

It seems that Xerox is short of cash and is looking to sell its Shugart Associates disk drive operation... Details are leaking out on the new Osborne computer. It is expected to offer twice the RAM capacity and storage of the Osborne One, include a 7in display and an optional 8088 add-in card with IBM PC compatibility. A hard disk option may come later. Price is expected to be between $2300-2500... Victor Technologies is said to be preparing a portable version of its Victor 9000... Cosmos-Gavilan is apparently about to introduce a portable computer with an 80x80 LCD display and a 3.5in disk drive that will fit inside a briefcase... Sinclair is thought to be working on a business oriented machine for possible introduction this fall. It is expected to have 128k of RAM, a flat screen, micro disks, to be IBM compatible and sell for about $500... There are rumours that IBM plans to alter its version of MS-DOS (they call it PC-DOS) so that it will have unique features and limit compatibility by competitors... Digital Research is working on a VMS-like, multi-user, multi-tasking disk operating system for the National 16032 chip. The DOS will not be related to CP/M. A first for DRI... There are rumours that now that Microsoft has implemented MS-DOS in the C language it will attempt to bring out versions for the Z80 and 68000... Intel is expected to supplement its ROM implementation of CP/M with an implementation of MS-DOS while Digital Equipment Corp is expected to implement its proprietary VMS operating system in ROM... Altos Computer Systems is expected to release a new terminal with a built-in Trackball and using the NEC 7220 graphics controller chip. Integrated software, high-intensity software packages to support the terminals will also be produced.

Steve Wozniak, creator of the Apple II, is rumoured to be working independently on a project using a new video graphics display technology which will eliminate most of the video support circuitry... It looks like the American National Standards Institute (ANSI) standard for micro-disks is floundering and there will be no standard adopted this year leaving the battle to be fought in the market-place... Data General is at last promising to enter the personal computer market later this year with a 32-bit system... And Prime Computer is also expected to enter the Personal Computer market with a desktop workstation using either the 8086 or 80186... Computer Distributors Inc, Bellevue WA, are rumoured to be ready to introduce the Pick DOS for the IBM PC. The Pick DOS is a business oriented DOS widely used on mini-computers to compete with the Apple Lisa that will be half the price of the Lisa. The units are expected to use the Z8000 16-bit and 6501 8-bit microprocessors... The Apple Mackintosh computer is now anticipated for September or October, cost under $2000 and aimed at the school and home markets. Units have reportedly been in the hands of software developers for several months... Tandy should shortly introduce the Model IV, replacing the III, with 128k of memory and 24x80 screen. Second will probably be a new colour computer with 64k of RAM and a lower price. And last a portable version of the model III selling for under $1000... Coleco is also expected to introduce a Z80-based micro system this summer.

IBM doings

As of the fourth quarter of last year IBM passed Apple Computer in monthly shipments of personal computers. It is expected that by 1984 IBM PC and IBM-like PCs will have grabbed at least 52 per cent of the $3-5000 personal computer marketplace... IBM has also introduced versions of its PC designed to function as replacements for the terminals used with its S/34 and S/38 and large mainframe computers. When used with the S/34 and S/38 the terminal costs $3400 and when used with large mainframes such as the 370s, 30XX and 308X the terminal costs $5800.

AT&T to release micros

American Bell (the independent AT&T subsidiary) has begun quietly to demo their new line of Unix-based micros to other AT&T subsidiaries. They are all high performance, high-priced systems using the MAC-32, 32-bit,micro-processor. The systems have networking capability and use the Fortune Systems 16/32 as workstations. DEC and Onyx are also expected to supply system components.

Rent a PC

General Electric ('GE'), one of the largest manufacturers of electronic equipment in the world, has gone into the business of renting personal computers and software to business customers. Initially they will rent IBM PC, Apple and Hewlett Packard equipment and ship through a packaged delivery service. GE believes that this is an excellent way for customers to try various machines and software before buying or needing systems just for special projects.

GE is offering to buy the systems from computer dealers and distributors rather than from the companies themselves. This may cause some problems with violation of dealer contracts. GE indicated that a typical rental for an IBM PC system would be $317 per week or $625 per month with GE maintenance included.

At the shack

Tandy has given up trying to market its Colour Computer outside of its own organisation and admits that it was never able to get this marketing effort off the ground. Last year Tandy had signed up RCA to distribute the system via its distribution network. However, only 60 dealers took the product on — with many later dropping it.

The Colour Computer, which competes against the Commodore VIC-20, TI-99/4A and Atari 400, got caught in the competitive squeeze when Commodore, TI and Atari dropped their prices to under $200. Tandy, which markets the unit via its own distributors as well, refused to drop prices or provide the margins sufficient for these independents to compete (see 'Home Computer Prices Keep Dropping' below).

Tandy is now in a quandary. By limiting its distribution to its own outlets it is losing market share to companies marketing through mass merchandisers such as Sears and K-Mart. The under $200 market place is becoming extremely competitive with very low margins and a great deal of advertising required to yield brand recognition (certainly not the Radio Shack style of doing business). However, by so limiting its distribution it can control selling price and maintain its profit margins. There are rumours that Radio Shack may pull out of the market with the feeling that the competitors are cutting their own throats.

The story on how Tandy came to adopt Microsoft's Xenix as its multi-user disk operating system for the Radio Shack Model 16, 68000/Z80 system is now leaking out. Tandy had introduced the system early last year with its single user TRS-DOS Z80-based DOS and promised to release an unspecified multi-user DOS within three

months. The scuttlebut is that Tandy wanted Xenix from Microsoft but Microsoft would not commit to this time schedule. So, Tandy approached some other software houses — including Ryan-McFarland and CRDS — finally entering into an agreement with the latter. Fearful of losing its competitive position in the Unix-based micro DOS market (the way Digital Research lost out to MS-DOS on the IBM PC), Microsoft approached Tandy late last year and offered to deliver Xenix for the Model 16 in three weeks if Tandy would commit to it. Tandy — thinking that Microsoft could never deliver on time — agreed. Microsoft coerced its software engineers into a non-stop three week effort and delivered Xenix on time and ahead of its competitor. Without Tandy adopting Xenix the product would be in second place behind Unisoft's UniPlus in the 68000-based Unix market.

Zilog sues NEC

Zilog has filed suit against NEC Electronics charging that they unlawfully copied the Z80 microprocessor and infringed on patents. They allege that NEC copied the Z80 and related chips and Zilog manuals in manufacturing their PD780 and PD780-1 micro-processors.

Home computer prices keep dropping

There still seems to be a lot of room for price cutting in the home computer market. I recently saw a newspaper ad for the Timex 1000 (Sinclair ZX81) offered by a mass merchandiser for $59.95 with a $15 rebate from Timex, which means that the customer got the unit for $44.95. There is no doubt that the price for this unit will soon go below $40, particularly when offered with software.

And I recently saw a toy store newspaper ad for the Commodore VIC-20 at $84.95. This appears to be a response to the introduction of the Timex 2000 (*née* Sinclair Spectrum) and TI 99/2.

It looks like a repeat of the calculator price wars. Thus we can expect eventually to see the Timex 1000 soon selling for $29.95, and maybe even as low as $9.95 with software. We are already seeing the Timex 1000 being used as a premium give-away to purchasers of cars and major appliances.

IEEE LAN standard close

The proposed IEEE 802.3 standard for Local Area Networking has moved a step nearer adoption with the endorsement by 13 key hardware and software vendors. This proposed standard has moved to the next level of approval by the IEEE microcomputer standards committee. From there it goes to the computer standards committee and IEEE standards board for final adoption. If everything goes well we may see it officially adopted by year-end

The standard conforms very closely to the Ethernet LAN as proposed by DEC, Intel and Xerox. This LAN standard is expected to be used by most high performance LAN systems. It should be noted that IBM and AT&T are known to be working on their own LAN systems which do not conform to the proposed standard. Further, the overwhelming majority of LAN systems already installed are of the low and medium performance type where nothing approaching standard exists, and in fact the situation may be termed chaotic.

Unix update

The implementation of Unix on 68000-based micros appears to be split evenly between two different implementations. . . Xenix from Microsoft, Bellevue WA, and UniPlus+ from Unisoft, Berkeley CA. There are a few vendors who have done their own 68000 ports but it is likely that they will switch to either Xenix or UniPlus+ to achieve some level of compatibility and a wider market base, since there is already some software available for these systems. UniPlus+ was the first port to reach the market and implements the Berkeley version of Unix which accounts for its popularity. Xenix on the other hand is an implementation of the Bell Labs version of Unix and comes from one of the largest micro software houses in operation today (namely Microsoft).

The 8086 and Z8000-based micros appear to be going with Xenix. The only other alternative here is Coherent from Mark Williams Co, Chicago, and they have not been aggressive in getting their product out.

National Semiconductor has already demonstrated their Unix implementation and one done by Human Computing Resources, Toronto, Canada. The initial results do not indicate that this implementation is any faster than the 68000, 8086 and Z8000 implementations despite the claim by National Semiconductor that this micro has been specifically designed to support Unix. The initial demonstrations of the product, however, are still considered prototypes and tuning should improve its performance.

Hot DOS competition

Digital Research and SoftTech Microsystems have both dropped the price of the Disk Operating Systems for the IBM PC. DR's CP/M-86 has been available from IBM for $250 and SM's p-System was $600 while PC-DOS (Microsoft's MS-DOS with minor changes) was offered for only $40. Reportedly, only about three per cent of the PCs have been sold with CP/M-86 and less than one per cent with the p-System. IBM also held up supplying these packages so that PC-DOS had the field to itself for several months giving it another advantage over its competition.

DR therefore decided to take marketing matters into its own hands and market an improved version of CP/M-86 for the PC themselves, and is making it available for only $60. SM and IBM announced that they will make the p-System available for $50 for the run-time system.

Video disk-based games expected

As early as this summer we can expect to see the appearance of the first video disk-based computer games. Using video laser disks these games are expected to appear first in the games arcades with home units to follow within another year or two. One such prototype unit was demonstrated at the Consumer Electronics Show, held last January.

The basic problem of slow access time (it can take as much as ten seconds to move from one frame to another with a typical access time of five seconds) is currently being attacked by developers. One technique proposed is to use two disk players in a game unit. This is feasible since the players are fairly low in cost.

IBM PC News

IBM has released an upgraded version of the PC (called the XT) with a 10Mbyte Seagate hard disk, Zebec controller and larger power supply. IBM took advantage of the chance to also change the printed circuit board to utilise the new 64k RAM chips so that now 64k is the standard minimum RAM size for the PC. Also the number of expansion slots was increased from five to eight and the dual-sided floppy disk capacity was increased from 320k to 360k per drive. IBM also increased the price for the basic unit (less hard disk drive) from $1265 to $1355 (following in the footsteps of the Apple IIe). The unit is $40 less than the Apple IIe and only a few bucks more than the new TI IBM PC compatible system.

IBM also finally started selling the Color CRT display they began showing at Comdex last fall. IBM is also offering its dealers a communications interface which will allow them to interact directly with the factory via phone, by-passing the US mail service. The likelihood is that

IBM will soon offer this interface to customers, too.

At the same press conference at which the XT was introduced, IBM also unveiled new models of the 3270 CRT terminals designed for use with the mainframes. One of the models can also function as a stand-alone personal computer. Further, another model uses the gas-plasma display shown at last year's NCC show. This significantly reduces the depth of the terminal.

Rumours are still rampant that IBM will soon introduce an 8086 or 80286-based system and low-cost consumer oriented system. A Stamford Conn, market research, firm (Gartner Group) predicts that this year IBM will sell 500,000 PCs. If we add to this another 200,000 to 300,000 IBM PC compatible systems made by other companies, then the operating system and disk format used here may finally establish a *de facto* standard in the 5.25 inch disk market that will ultimately challenge the 8 inch CP/M standard.

Home computer price wars

TI and Commodore are going through a new round of price cuts for the home computer — an action that Tandy has called 'cut-throat'. Both companies slashed $50 from the price of their already 'slashed' prices for the TI 99/4 and Commodore VIC-20 bringing selling prices down to the $130 level.

Atari, in an attempt to be competitive, introduced an 'under $90' keyboard add-on for their 2600 video game system to convert it into a low-cost 'home computer'. This has been seen as a defensive move since the low-cost personal computer appears seriously to have impacted the sales of video game units. Atari also recently introduced a $55 rebate for the Model 400 to effectively lower its price to just under $200. TI and Commodore broke the $200 barrier five months previously.

TI recently introduced its 99/2 computer with a dealer cost of $75. Tandy is expected to introduce a new lower cost colour computer to replace their current unit which has a $299 price tag. There are rumours that the unit, made in Korea and costing $150, should appear soon.

Atari, in an attempt to reduce manufacturing costs, laid off 1700 workers and shifted a large part of its video games and personal computer manufacturing to the Far East.

Super-microprocessors — a status report

National Semiconductor demonstrated its 16032 system recently at a Unix conference running a port of Unix done by Human Computing Resources Corp, Toronto. Further, it has been accepting orders for the chip set promising production quantities this summer. The company has been shipping sample quantities for several months. Thus we can expect to see initial shipments of 16032-based systems before the end of the year.

NS is expected to start shipping their 'Mesa' system this fall. The Mesa, an 8-user system, is expected to contain the 16082 memory management unit with a 32-bit wide virtual memory. NS is promising to start sampling its floating point co-processor chip this month.

The 16032 is reported to be really a 32-bit processor with 16-bit I/O. The 32032, which NS says it will begin sampling in the fourth quarter of this year, is reported to be an upgrade of the 16032 with true 32-bit I/O. Further, NS claims that it will be possible to build a fault-tolerant transaction system by running two 32032s in parallel and comparing results on alternate memory cycles to detect soft errors. NS says the 32032 will be 1.8 times faster than the 16032.

The Motorola 68000 although doing many operations — 32-bits at a time — has an internal 16-bit wide data path and hence the redesign task to move up to a 32-bit version (68020) is a more difficult undertaking for Motorola vis-a-vis National. The 68020 is being promised for April '84 (samples) and August '84 (production). This will be Motorola's true 32-bit micro operating at 16Mhz. It will do 32-bit multiply/divide. The device will use 150,000 transistors, consume 1.5 watts and have approximately 100 pins.

The Motorola 68881 floating point co-processor production schedule has slipped and Motorola is now promising samples in July '84 and production quantities in December '84. It will contain eight 80-bit registers, have all the addressing modes of 68020, be compatible with the IEEE floating point standard plus some additional functions.

The Motorola 68010, its 16-bit micro with virtual memory facilities, is now being sampled and production is expected this summer. The maximum clock speed will be 16Mhz.

A crimp was thrown into Intel's 286 project and 32-bit upgrade when a large group of engineers upped and left their Portland OR operation to form a Unix systems house based on Intel's technology. However, Intel is already shipping limited production quantities of the 80286.

The NS 16032 will compete with the Motorola 68010 while the 32032 will compete with the Motorola 68020. Samples of both the 16032 and 68010 became available at about the same time with NS promising earlier production quantities. It appears that NS may be sampling and producing the 32032 well ahead of Motorola's 68202. Thus although National was very late entering the super-micro marketplace it appears that it now has a good opportunity of garnering enough to be worthwhile.

Further, Digital Equipment Corporation is rumoured to have given its 'VAX-on-a-chip' program top priority and NCR is expected shortly to start sampling its 32-bit chip set to external customers. It is also likely that Western Electric may soon start selling its Bellmac 32 chip set to external customers.

Intel is expected to bring out a new 32-bit micro that is upward code-compatible with its 8086 processor. It is expected in the second half of next year and is tentatively called the 80386.

One last note is that the new 32-bit micros are expected to be implemented in CMOS to reduce the power consumption and heat dissipation of these devices.

Where is the iAPX432?

It is over two years now since Intel introduced its iAPX432 32-bit microprocessor chip set and as yet no commercial product has been introduced using it.

Many of the pioneering users who started product development projects using the 432 have since cancelled the projects or put them on hold due to performance limitations which have shown up with the 432. First of all Intel was a year late in delivering samples and then some users claimed that the samples delivered operated at only 20 per cent of their rated speed.

Further, the unique architecture of the 432 meant that companies were starting from ground zero in software development, and software development tools and support chips have been slow in becoming available. The complex architecture also means that the software development task is more complex and more expensive and few companies have been willing to make the investment.

Intel is currently starting production on the third revision of the 432 chip set which it hopes will finally meet Intel's original performance claims. Also, the bus interface and memory control ICs are expected finally to become available and we will soon see 432-based systems being introduced.

Intel text co-processor chip

Intel has announced an IC (82730), to operate in conjunction with its 8086 16-bit micro, that provides word-processing display functions such as proportional character spacing, smooth scroll, display of superscripts and subscripts, variable fonts, allows users to define their own character sets and provides complete corres-

pondence between display and printed copy. The unit can also be used in conjunction with Intel's new 82720 graphics co-processor allowing mixing of text and graphics on the screen. IC samples are now being supplied to OEMs and production is expected this fall.

Hard disk drives shrink

The portable and desktop computer markets are increasing the need for smaller disk drives. Hard disk makers are now striving to reduce the size of the five and ten Megabyte hard disk drives to match the size of the new micro-floppies. The problem is that no standard form factor has yet emerged for these drives. Further, there is no agreement on media size, total drive package size, interface, transfer rate and recording format. The result is that, although the demand is there, the manufacturers are floundering trying to figure out which way to go. It is likely that manufacturers will use the ST506 interface used on 5.25 inch drives as the standard interface with the same transfer rate.

Seagate has already committed to building a 3.25 inch micro-floppy and will probably have the same size in their micro winchester while Tandon and Shugart are committed to the 3.5 inch size. Syquest Technology, the only vendor currently shipping micro winchesters, is using 3.9in media.

PCN vs LAN

Manufacturers have been fighting among themselves for several years now to develop a standard for Local Area Networks (LANs) with little progress being made. In the meantime Personal Computer Networks (PCNs) have moved into the market. The PCN interconnects a small number of personal computers allowing them to transfer data and share peripherals such as high-speed printers and large capacity hard disks. When a personal computer is used as part of a PCN it is referred to as a 'workstation'.

Although of lower performance than the LANs, the PCNs are now threatening to overshadow the marketplace. Strategic Inc, San Jose CA, a market research firm, estimates that nearly 12,000 PCNs were installed up through the end of last year — compared to only 800 base-band and broadband LANs. Further, it predicts that by the end of 1987 there will be 110,000 PCNs.

This trend is apparently due to the fact that most installations include only a small number of workstations (typically six or less), use lower data transfer rates and have less traffic, and hence high performance is not required. Also, some PCN makers offer interfaces to allow the PCN to serve as a gateway into an LAN. The problem with PCNs are that there is no established standard and interfacing different peripherals may be a problem.

Low cost PCNs ($300-500/station) typically use either twisted wire pairs or coaxial cable to interconnect devices transmitting data at anywhere from 800k to 2.5 Mbits per second (bps). A single personal computer or special interfaces may be used. In higher performance, higher cost (typically $2000/station) PCNs coaxial cable is used with controller/transceivers at each station.

Japan in US market

Nippon Electric (NEC), a $6 billion a year company which dominates Japan's personal computer market, entered the US over two years ago with a modes marketing effort. They now claim to hold three per cent of the 16-bit micro market, which is roughly 20 per cent of IBM's share and close to 30 per cent of DECs share. Sony and Epson also entered the US markets last year with 8-bit and portable machines.

Japan has proved that it can build good machines and is committed to long term investments in establishing its position in the marketplace. However, it has met with problems. The rapid pace of change and the innovations introduced by American competitors have proved a formidable challenge to the Japanese whose products are generally unimpressive.

However, it was only two years ago that US IC memory and printer makers were boasting that they would outmanoeuvre and outproduce the Japanese. However, manufacturing and quality control problems in these two markets created opportunities for the Japanese. Using conservative technology and improved manufacturing techniques they now dominate these markets. The Japanese are now attacking the floppy disk and hard disk markets with the same techniques. It is likely that they will attack the segment of the personal computer market that is less innovative and use older technology with success. For example, a portable 8-bit microcomputer, such as the Osborne, is an ideal candidate for Japanese competition.

Offshore manufacturing

American microcomputer and component manufacturers are moving their manufacturing facilities outside the US to maintain their competitive positions in a marketplace that is becoming increasingly more price competitive. They are setting up plants in Taiwan, Singapore, India, Mexico, Puerto Rico, Brazil and France.

The auto computer

At a recent automobile show in New York City, Ford showed a prototype car called the Concept 100 that is slated for introduction next year. Among other features it sported a touch-sensitive 5 inch CRT built in to the dash and a Z80 CPU. General Motors showed a prototype of its 1995 Buick Queston with a flat screen built into its dashboard.

Who sells micros?

Future Computing Inc, a Texas marketing research firm, claims that this year computer stores will sell $3.5 billion worth of micro-computers, while $900 million will be sold by systems houses, $600 million by mail order, $500 million by office-products suppliers and lastly $500 million by industrial distributors.

No business like show business!

The Comdex Fall Computer Show now claims to be the fastest growing show (of any kind) in the country. Its last show exhibit space almost doubled and attendance increased by a whopping $125 per cent. The only larger computer show is NCC (National Computer Conference). NCC and Comdex Fall are so large that there are few convention facilities that can handle them. The Las Vegas Convention Center, believed to be the largest single-floor hall in the country, is already too small for the next Comdex show and it is spilling over into two other hotels.

Random bits

Later this year Harris Corp plans to introduce the CMOS version of the Intel 8086 and DEC PIP-11... As Sinclair/Timex have now introduced the Spectrum/Timex 2000 in the US, one wonders when they will introduce the micro-drive and RS-232 add-ons for the unit that they have been advertising, but not delivering, in the UK for almost a year now... The IEEE 796 Bus (Multibus) Standard has to be adopted by the IEEE and is now an official standard. Also, the IEEE expects to shortly adopt the Binary Floating Point Arithmetic (IEEE 754) and Assembly Language Mnemonics (IEEE 694) standards... For those into country and western music check out the record titled *Basic Ain't the Language of Love.* It tells the story of a woman involved with a personal computer addict...

Quotation of the Month

'I am not an Atari Democrat.' Alan Cranston, announced candidate for President. END

MICRO CHESS

ALPHABETICAL CHESS

Tony Harrington interviews Don Beal on the subject of his computer chess search theory inter alia.

Don Beal is not an entrepreneur or a supplier of micro-chess computers. He's a lecturer in the computer science department of the University of London's Queen Mary College. There may come a time, if all goes well with his research, when a Beal chess computer will come onto the market place. But that would be more or less incidental to his real interest, which might be described as the theory of computer chess programming.

I almost met Beal last September when he was due to enter the *PCW* tournament. His program was then running on a mainframe computer and he was struggling to transpose it to a micro. On the opening day of the tournament there was still some slight possibility he would succeed by the start of the third round. But he didn't. It was a great pity, since his presence would have considerably strengthened the amateur entry.

Among the computer science and artificial intelligence communities a certain dabbling in the problems of chess programming is fairly common. But Beal is unique in that his daily work as a lecturer – as well as his research – is concentrated to a large extent on computer chess search theory.

How did this come about? Beal learned his programming skills working for the Ministry of Defence before joining Queen Mary College. He played chess as a schoolboy and was reasonably enthusiastic about it – making the school team, and winning the school championship. When he went to university, however, chess quickly came to seem merely a way of wasting valuable time.

At the MoD his work with computers led to an interest in the potential of artificial intelligence. 'It occurred to me that chess would be an ideal field; a nice, limited problem with which one could investigate some aspects of AI. In fact, as I got into it, it turned out to be a huge problem,' Beal recalled.

He began a doctorate on computer chess, which he still brushes the dust off from time to time, and hopes one day to finish. And, since some portion of his teenage years had been spent mastering the secrets of electrical engineering, a few years ago he began to build microprocessor boards to turn his theories into practice.

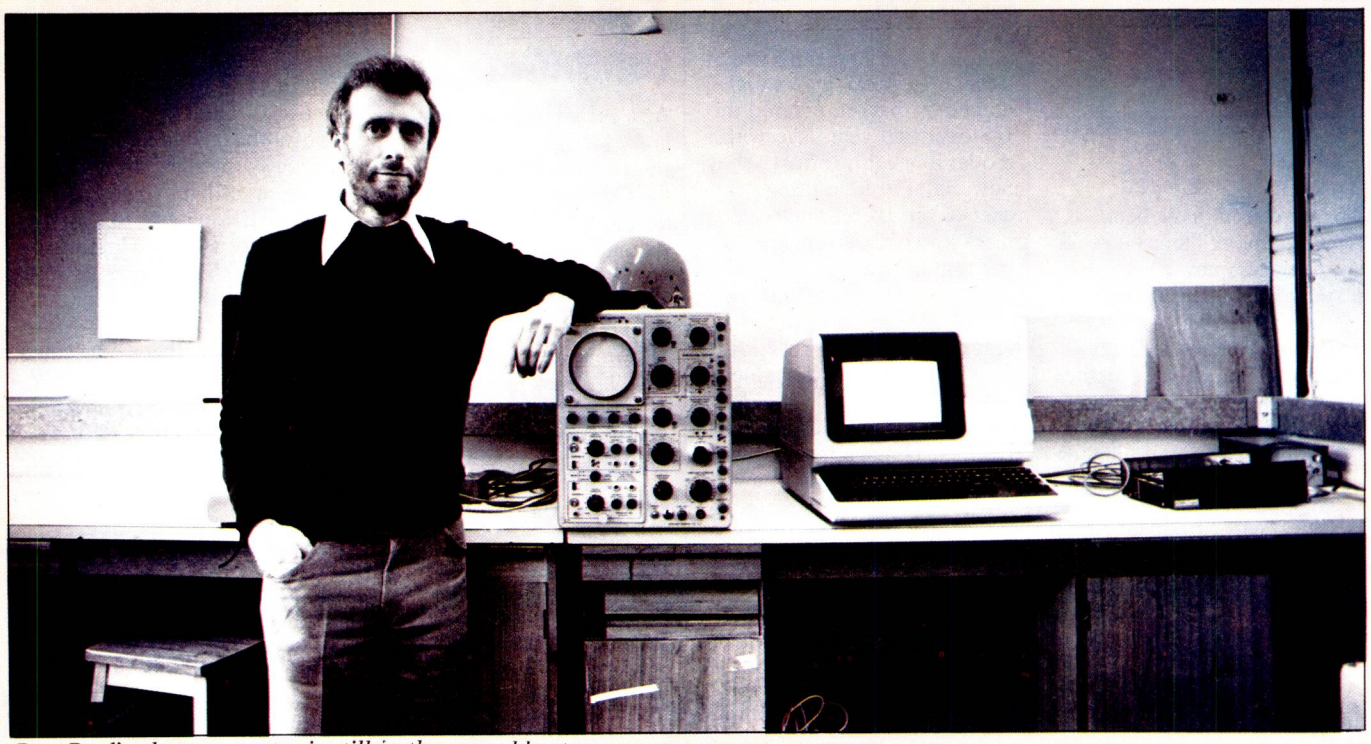
Most of the material that he works with is a closed book to me, and minimax search theory is not something to be picked up lightly in the course of an hour's chat over coffee. So those of you who have wondered from time to time how the machine does it when it nicks your rook unexpectedly, won't be much wiser by the time you finish reading this. That topic is one we will return to in another column another day.

Part of the problem is that the language used by Beal and his colleagues to talk about games theory bears a misleading relationship to English. I thought I followed reasonably well, for instance, when he explained his job at Queen Mary College. It involves, he said, some research into minimax theory, particularly the question of why it is that look-ahead systems result in better moves being played by the computer. 'For many years now look-ahead has been known to be effective in practice, but people have not made much progress in explaining in a convincing way, at the theoretical level, why this should be so.'

When he'd finished saying this, I nodded wisely and confessed to being totally baffled. Beal, it seems, has produced a reasonably convincing theoretical argument which does provide such an explanation. 'Does it mean there will be better chess computers?' I asked. 'Not really,' he said. 'It just explains why doing the things they are doing already produces reasonably good chess-like decisions.'

One piece of theory which might be of interest to readers new to this sort of thing did emerge from our chat. There is a well known algorithm in chess programming which saves a great deal of time without any risk that the short cut it produces will lead to the machine overlooking some vital move. It is called the Alpha Beta algorithm.

'The algorithm involves the idea of accumulating 'bounds' as the search pro-



Don Beal's chess computer is still in the assembly stage.

ceeds. As the program moves through the search tree, it locates a worst move sequence for white, and a worst move sequence for black. When you find this, there is no point in looking any further for an even worse sequence. Instead the program stops looking at move possibilities once they equal this value. In other words, it sets a bound or a limit on the search. At any moment in the search then, you have a best and a worst possible bound,' he explained.

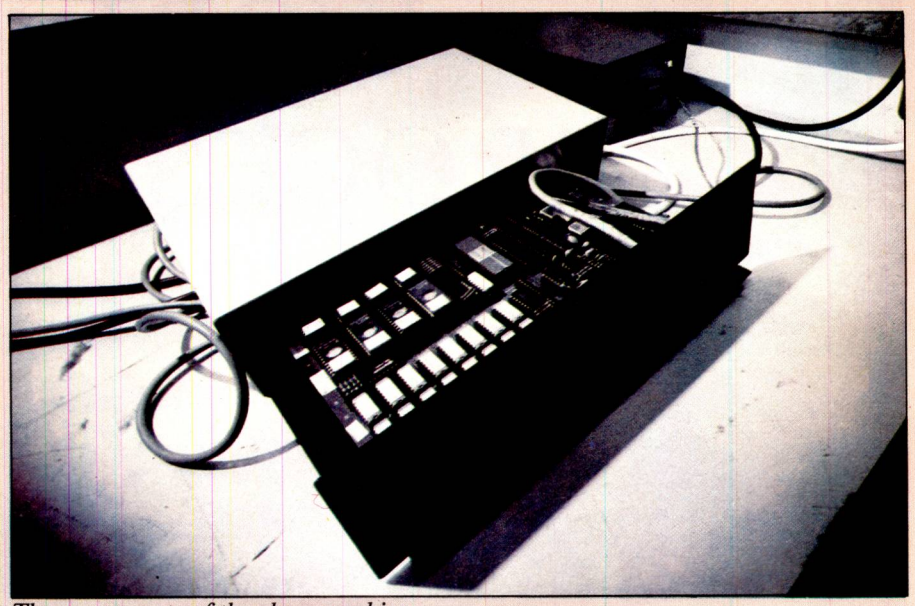
The advantage is that where a standard search algorithm will go on to look at every possible move, using the Alpha Beta algorithm will save a very precisely definable proportion of search time. At its best, the algorithm will reduce the number of possible moves looked at (or search nodes, as they are called) to the square root of the number of moves that would otherwise be looked at. On a search sequence that would normally look at a million moves, for example, it will result in a thousandfold improvement (ie, the program will only need to scan 1000 instead of 1,000,000 search nodes).

How well all this theory translates into practice can be seen in the games section where one of Beal's program victories can be studied at leisure, together with David Levy's comments on it.

Beal's own micro is still in the assembly stage, and when I spoke to him, he thought it would need a month or two's 'uninterrupted work' to be brought to full tournament strength. The heart of the machine, Beal says, is a piece of fast sequential logic. 'This bit of hardware is what makes it different from the Thomas Bell hardware (Belle). Belle is a huge piece of hardware. Its inventor calls it portable, but it weighs about 60 pounds and you have to be dedicated to carry it about. My machine is about the size of the usual hard cover book and it will have around one quarter of Belle's search speed,' he explained. ('One quarter' might sound like a modest development, but it should be enough to make Beal's machine an absolutely formidable opponent. It would give it a much faster search speed than any of the current commercially available micros.)

Beal has used some very expensive chips in the construction of his machine, and working on the usual rule of thumb that a retail version should cost four times the component price, it would be priced out of the range of all but the wealthiest chess enthusiasts if it ever came to the marketplace.

At least, that is what he thinks at the moment. But if it ever gets out of its academic environment it might well find a businessman to get the production lines rolling and the prices down.



The components of the chess machine.

Games section

White: BCP; Black: 'Strong player on an off day' Sicilian Defence: Notes by David Levy

1 e2-e4 c7-c5
2 c2-c3

(This move has become extremely popular in recent years. Its chief merit is that it avoids the volumes of openings theory that have been written about the Sicilian Defence, but it must also be said that the move c2-c3 is not so easy to meet as might first appear. White threatens immediately to establish a powerful pawn centre with d2-d4.)

2 ... Ng8-f6
3 e4-e5 Nf6-d5
4 d2-d4 c5xd4
5 Bf1-c4!?

(An interesting gambit. White offers a pawn in return for a lead in development.)

5 ... Nd5-b6
6 Bc4-b3 d4xc3
7 Nb1xc3 e7-e6

(Blunting the attack along the b3-f7 diagonal.)

8 Ng1-f3 d7-d5

(This move may be playable, but I think it possibly premature. I would have played 7...Bf8-e7, followed by ...0-0, and only later try for ...d7-d5.)

9 e5xd6 e.p.

(This *en passant* capture leaves White without the cramming influence exerted by his pawn on e5, but in return it (I almost said 'he') develops a strong initiative.

9 ... Bf8xd6
10 0-0 a7-a6?

(Black was worried, with good reason, about the possibility of an eventual Nc3-b5 by White, but the text wastes too much valuable time, and allows White's initiative to grow even more dangerous.

Better would have been 10...Bd6-e7, or 10...0-0, or 10...Nb8-c6.)

11 Bc1-g5 Qd8-c7?

(Black should have played 11...Bd6-e7, and if 12 Bg5xe7 Qd8xd1 and 13...Ke8xe7, with an extra pawn and few real problems. Note that after 12 Bg5xe7 Black cannot recapture with the queen because of 13 Qd1-d4, forking the pawn on g7 and the knight on b6. This theme recurs again during the game.)

12 Ral-cl Nb8-c6
13 Nc3-e4 Bd6-e7

(Black was by now torn between the devil and the deep blue sea. The other retreat, to f8, would have left White with such a commanding lead in development that it would have been extremely difficult for Black to survive. Nevertheless, that is the course that I would have followed, because now Black loses castling rights for good.)

14 Bg5xe7 Qc7xe7
15 Ne4-d6+ Ke8-f8
16 Rf1-el g7-g6

(Hoping to escape with the king at g7, but he should have tried ...h7-h6, possibly followed by ...Kf8-g8 and ...Kg8-h7.)

17 Nf3-d4 Nc6-a5
18 Nd4xe6!

(The first surprise. White wins back the pawn with a little combination.)

18 ... Bc8xe6
19 Qd1-d4 Rh8-g8
20 Bb3xe6 f7xe6
21 Rc1-c7!!

(Simple and decisive. If Black captures the rook, White's queen comes in on f6, forcing mate.)

21 ... Nb6-d7
22 Rc7Xd7! Black resigns

(Again the capture of Black's rook allows 23 Qd4-f6+, with mate next move. A convincing display by White, fully justifying the pawn sacrifice in the opening.)

A short apology

Before my post box is crammed with letters pointing out that Hegener and Glaser do not make a machine called the Roman II or even the Roman III, let me explain how these mysterious machines came to find their way into last month's column. Some thirty lines of copy were added to the article rather late in the day. I painstakingly read these lines out to a kindly colleague down the other end of the telephone line. To make sure that no mistakes occurred over the phone I said, when I came to talk of the Mephisto III, '... the result, in the Mephisto III's case – that's Roman iii, not arabic, got it?' 'Yes,' said my colleague, and wrote: 'The result in the Mephisto and Roman III's case is that it now plays a very intuitive game.' Those of our readers with sharp eyes and long memories will have noticed that the same fate befell a comment made on the Mephisto II a little further down the column. May we respectfully hope that those of you who fell off your chairs laughing at us didn't bruise yourselves too badly! END

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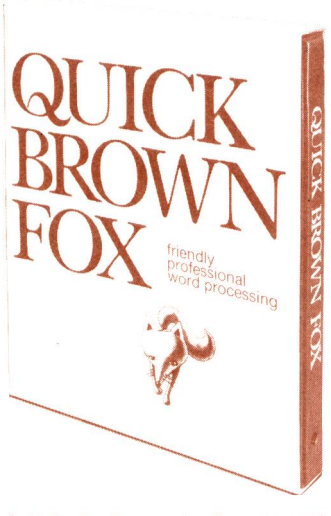

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SEE US ON STAND 30 AT THE INTERNATIONAL WP EXHIBITION WEMBLEY

LESSON IN LOGO

Dick Olney went back to school recently. Here he reports back to us on the latest educational tool, the programming language Logo.

Being a fairly recent convert to Seymour Papert's ideas regarding the use of computers in schools, I was excited to find his name billed as the introductory speaker at the AISB conference on artificial intelligence (AI) and education. Since a weekend in sunny Exeter seemed infinitely preferable to standing in the rain watching thousands of — presumably quite sane — health freaks run half way across London, I decided to go along and see what the great man had to say.

If you haven't read *Mindstorms*, Papert's book on the use of Logo, I suggest you do immediately. I can't begin to do him justice in this article, but some of the main points are as follows. Papert believes that the traditional dichotomy of 'scientists' (particularly mathematicians) versus 'artists' is counterproductive and in no way reflects the reality of an individual's cognitive potential. He argues that the emphasis of schools on the acquisition of knowledge can have the effect of alienating the child from particular areas of study, not least because the 'facts' presented frequently have little applicability in the child's everyday life. Children, after all, have a powerful facility for natural learning, which can only be utilised with an approach which teaches children *how to think*, indeed how to *think about thinking,* regardless of subject matter.

The programming language, Logo, is presented by Papert as an educational tool which is not merely an extension of normal teaching practice, but which provides an entirely new learning environment where traditional relationships between teacher and child are radically changed. Fundamental to the Logo programming language is 'turtle' geometry. By giving the turtle (a small screen based creature) commands such as forward, right, left, etc, simple shapes and patterns can be designed. Useful routines are defined as new commands (much like Forth) which are then combined to produce complex programs. These programs can then be easily debugged because they are reducible to readily comprehensible 'mind size bites'. Throughout all this, children are able to predict the outcome of a series of commands by putting themselves in the position of the turtle (playing turtle). This active association between the child and the turtle is in direct opposition to the kinds of dissociated activities, such as the endless repetition of times tables, so common in the contemporary classroom, and is an example of what Papert terms 'syntonic learning'.

I have dedicated the previous two paragraphs to Papert's ideas partly to compensate for the fact that, due to unspecified ill health, he was unable to attend the conference. A note to this effect was pinned on the notice board when I arrived, together with a copy of his original telex agreeing to attend, as if the organisers felt the need to prove they had not purposefully dragged us all that way under false pretences. Nevertheless there was plenty on the agenda, with workshops in Logo and Prolog, discussion sessions and no less than twenty different papers being presented.

The introductory speech was given by Dr Jim Howe of Edinburgh University. Like Papert his concern is with Logo, but their approaches are quite different. Dr Howe and the 'Edinburgh school' dismiss the concept of undirected learning as unpractical and Utopian preferring a more traditional approach through the use of work sheets and specific projects. While this approach tends to suppress some of the most exciting aspects of the Logo 'learning environment', eg, spontaneity and self-direction, one has to admit that it is much more easily integrated into present classroom procedures, and as such less threatening to the teachers concerned. For these reasons there can be no doubt that, in this country at least, Logo will initially be implemented in this way. Dr Howe and his colleagues are presently working on a series of work sheets which should be available towards the end of this year.

My disappointment at the lack of Seymour Papert was offset to some extent by the presence of the delightful Cynthia Solomon, one of his closest associates. Cynthia — along with many of the original Logo researchers — is now working at one of the Atari research centres in Cambridge, Massachusetts. She was at the conference to demonstrate a pre-production version of the forthcoming Atari Logo, which should be available in the autumn. This implementation makes full use of the Atari's player missile capabilities (there are four turtles), giving rise to one of the Atari Logo's most interesting features, that of collision detection. Background procedures, called 'when demons', can be set to activate on detection of any one of a variety of collision conditions. Incidentally, the coming Acorn Electron will feature Logo, and versions are also being produced for the CBM VIC 64 and Sinclair Spectrum machines, but these are unlikely to be on sale before next year.

I should note that Logo is, of course, old hat to Cynthia, who is now working on a language called Gesture. She was not overforthcoming on details of her work.

But from what I can gather, Gesture is, as you might imagine, a language which works by direct perception of body movements. Quite how it distinguishes meaningful movement from peripheral activities, such as nose picking or thumb sucking, I can't imagine, but I'm sure all will become clear in the fullness of time!

Although Logo undoubtedly emerged as the favourite language at the conference, it was by no means the only language presented. The antecedent of all AI languages is Lisp, an introduction to which can be found in the May issue of *PCW*.POP II was also discussed. Logo itself is written in Lisp, as is the other main language featured over the weekend — Prolog.

Prolog differs from most programming languages in that it is 'declarative' rather than 'procedural'. The following extract from a paper by Robert Hawley of Plymouth Polytechnic summarises the basic principles of Prolog :*Prolog provides an easy way of specifying particular types of program in terms of the rules governing the problem rather than in terms of the procedure needed to solve the problem. The procedure is embedded within the Prolog system and each program makes use of it implicitly rather than explicitly.*

Prolog certainly does hold a great potential for educational use, though descriptions of its power varied from 'the language of God' (Richard Ennals) to 'pretty neat' (an American). The 'main man' with regard to Prolog emerged as Professor Robert Kowalski (language of God school) who also, as it turned out, was the most powerful speaker at the conference, in style if not in content. The name Prolog is derived from 'programming in logic' and its importance for Kowalski derives from its use as an instrument in introducing formal logic to the school curriculum. My own feeling is that 'formal logic' is about as useful in real human decision making as differential equations, and has little or no applicability outside the academic environment. Presumably, however, Professor Kowalski spends most of this time inside the academic environment where logic is protected from the more unpredictable elements of the human psyche.

One point on which everybody agreed is that Basic, as a language, should be discarded immediately. Basic may or may not have its uses, but as a first programming language it is confusing and inadequate, not least because it's so difficult actually to do anything worthwhile with it, without a lot of effort. Before long the computer manufacturers will realise this, and I predict that the language will become an historical curio within the next five years!

Footnote

Intelligent Educational Computing, an overview of the AI approach to educational computing, by Mazoud Yazdani will soon be available for £15.50. It can be ordered now from Ellis Horwood Ltd, Market Cross House, Cooper St, Chichester, W Sussex.

Two summer schools on Logo programming are to be held in July and August at Edinburgh University. Details from K R Johnson, The Logo School, Dept of AI, Forrest Hill, Edinburgh, tel (031) 667 1011 ext 2556.

CHECKOUT

ACCOUNTANCY AID

Alan Secker analyses the businessman's accounting requirements and assesses the instrumentality of accounting software in simplifying his work load – in terms of time and cost saving. We present (in an edited version) his comprehensive questionnaire which throws some light into this dark corner.

Now that I have a computer, shouldn't my accountancy bills go down? How often have I heard that?! The plain fact is that the one need not follow the other as sure as night follows day. It 'depends'.

Microcomputer accounting software at present often possesses many glaring deficiencies. Glaring, that is, if you have already learnt what to look for. It is these deficiencies that add to – rather than detract from – the burden of your accountant and/or your auditor. It can also affect the time it takes and the number of queries asked of you by the VAT Inspector when he examines your records.

Some of the problems may be overcome by improved procedures; some by changes in the software, but some, you will have to accept as a trade off against the benefits of a computer system, namely:
- speed
- arithmetical accuracy
- efficiency
- reliability

Cash book

The concept of the 'cash book', so long ignored by suites either imported from the United States or rewrites of the same, has for some time been banished to a wilderness. It is now beginning to return. For example, Microshade have one. For those that do not know, the cash book is the document that records the ins and outs of your most active bank account, normally your current account. For any given period it will disclose:

(i) The balance at the commencement of the period (ie, in hand or overdrawn)
(ii) Receipts (sums received) from customers (sales ledger)
(iii) Receipts from other sources (nominal ledger)
(iv) Payments to suppliers (purchase ledger)
(v) Payments to non-suppliers, for example, wages cheques, (nominal ledger)
(vi) The balance at the end of the period.

The reason that there is no direct equivalent to the cash book is primarily due to the way accounting software is constructed. It is invariably sold in encapsulated modules each corresponding to a different ledger. For example, if you were to acquire a sales ledger package, then it would (see note 1) contain a cash received routine which would only deal with receipts relating to the sales ledger. Thus the sales ledger package will happily accept receipts from customers, but if you were to deal with the repayment to a customer, for example, in respect of a return of goods, you would have to deal with this under a completely separate routine (see note 2). The same problem arises with the purchase ledger, and so there are two cash transaction reports in respect of each ledger plus an opening and closing balance that represent the cash book for any given period, not an easy concept to hold in one's mind.

Very few packages draw these components together to produce a cash book. Even if they do, is it in a useful form? Before answering that question, let me tell you what answer you would get from a software vendor if you mention the absence of a cash book. His reply would be 'but the information is in the nominal ledger'. To some extent that is true. The totals (if you are lucky) from each of the six sources mentioned above, should have found their way to the bank account as part of the nominal ledger but in no way can you go directly to *the* cash book to find

General

Must all entries be followed by a carriage return or will the system accept single character input such as 'Y' or 'N' in appropriate circumstances?
Are data entry forms fixed or can they be modified by the user?
How customisable is the system?
Does it take advantage of the maximum available memory?
Does it use highlighting?
Do data inputs indicate data type and number of characters?
How many decimal places does the system work to?
How many digits are allowed in working numbers, and how many in total numbers?
Can the system handle:
– multi company situations (*viz* groups of companies)?
– branch accounting?
– pseudo consolidations as subsidiaries of a group?
Do you have a reference for the number of accounts, each with a specified number of entries that can be held on a disk for a given system?

Ledgers

When entering the content of an invoice, the layout of the input screen very often determines the speed with which the data can be entered.
What form does the screen take:
– full screen questionnaire?
– item by item displayed?
Is document numbering accomplished by:
– automatic incrementation?
– user insertion?
Does the system allow input to be handled by:
– single item entry and posting?
– batch entry and posting?
If batch entry is allowed, are nominal items automatically grouped before being posted or are summaries provided and output at the end of each input batch *viz* sales journal or purchases journal?
Is a recovery procedure available if an item is to be posted to an account that is not yet opened or at least is not yet named?
Can individual ledger accounts be examined on the screen? (By individual ledger accounts one refers to all the transactions including opening balance and closing balance for all periods of activity that are held on the current disk file.)
How are journal entries dealt with and what is their general appearance on:
– the screen?
– a printed report?
What printed reports are generated?

details of any item you require. Instead, you have to go from one listing to another, reading the cross references as you go. The answer as to why this will frequently be necessary is outlined in 'Bank reconciliation'.

Notes

1 It may not. Some (Pegasus or TCS, for example) allow you to do several different things in the same entry routine. The net result is that your listing of the transactions is neither one thing nor the other.

2 Similarly, in some packages you can combine receipts and payments in the same routine. It allows for loose discipline and – in my view – contributes to making the system less easily understood by outsiders, such as your auditor, accountant, etc.

Cheque numbers

In the perfect system, only one cheque book should be in use at any time. This ensures that when cheque details are introduced to the system, they will be sequential. In a manual system one can tell 'at-a-glance' whether a cheque is missing from a sequence and, if so, the auditor will invariably enquire as to why. Indeed, experienced bookkeepers will usually enter the details of a cancelled cheque as a NUL line stating that the cheque has been cancelled, rather than incur the possibility of later time-wasting in answering the auditor's inevitable question. In the computerised system, an undisciplined user is going to have cheque numbers all over the place. He may pay suppliers throughout an accounting period (month) interspersed with wages cheques, PAYE cheques, etc – the net result being that an audit check is going to be slow and laborious.

The only kind of package that can handle this situation is one that will allow entry of cheque payments regardless of destination and similarly of receipts. So far I haven't found one that will run on any of the machines with which I am familiar.

Solution

Before giving a possible solution, let me give you a cardinal rule about purchase ledger systems. If a transaction generates an invoice or its equivalent (rates demand, for example), then pass it through the purchase ledger system. The benefits include:

(i) All such bits of paper will be filed in one place (purchase invoices file);

(ii) They will all be reference numbered in the purchase journal and, hopefully, the same numbers will be written on the documents themselves thus making them relocatable; and

(iii) Most of your payments will be to suppliers in settlement of such bills and what payments are left will not be numerous *viz* items such as PAYE, cash cheques, VAT and bank charges, etc.

Note: Direct debits and standing orders, when made in respect of payments to suppliers, should be tested like cheque payments and entered together with them.

The solution is, therefore, that *two* cheque books are needed, one for suppliers (purchase ledger) and one for the remainder (nominal ledger).

Bank reconciliation

The method for proving that one's bank transactions are properly recorded is to compare them item by item for the period under review with the bank statement, and to make a list of all the differences. The differences should all represent transactions which although being revealed on succeeding bank statements had not been processed at the last date on the statement in hand.

In order to check the bank statement, you now have to check it against six possible sources of data; two from the sales ledger, two from the nominal ledger, and two from the purchase ledger. This assumes that you have only done one posting run during the period in hand. If you have done more, then you have to multiply the number of documents you have to check from. True, if you have implemented the two cheque books' approach, the payments will be relatively easier to locate but what about the banking?

Bankings

On any day when you pay a number of cheques into your bank, you probably enter them on a single paying-in or bank giro credit slip. However, when you come to enter them, most may be from customers and destined for your sales ledger; the remainder being for your nominal ledger.

When you eventually get your bank statement, the figure you will see for that day's lodgements will be the same as the total of your paying-in slip. But that figure will not appear in your accounting records!

How, then, do you handle the reconciliation of bankings? The answer is 'with difficulty'!

Solution

Clearly the answer must be analogous to the solution for the payment side. You should either use separate paying-in slips for suppliers' cheques (sales ledger) as opposed to non-suppliers' cheques (nominal ledger) or, alternatively, use completely separate paying-in books but mark them clearly.

This in itself does not necessarily solve the problem. If you are entering the transactions of, say, several days' bankings, you may find that the routine used will not allow you to subtotal the transactions for any day before going on to those for the following day, and as a result you will simply obtain one single total for the whole period (say, a month). This means that again you have no figure from your accounting system corresponding with the receipts side of your bank statements.

GOTO page 236

Bank accounts

Does the report generated from the entry of lodgements (received cash book?) produce a total of the day's lodgements – the same figure as would appear on the bank statement?

Must the bankings report be generated on a daily basis to achieve such a total or will the system still produce a total of a giro slip if, say, a month's transactions were entered as a batch?

Is a Cash Book or its equivalent generated?

Can the system tolerate more than one bank account and identify it?

How does the system allow account titling?

How are deposit accounts recorded?

How are standing orders handled?

Payroll

Will the payroll handle the generation of both weeklies and monthlies at the same time?

Will the program accept the default gross pay and use this unless otherwise instructed?

Can a default gross pay figure be amended on a one off basis, and be returned to 'automatic' at the next calculation date?

Can the system handle holiday pay – *viz* give two or three weeks' pay with appropriate free pay in the calculation?

Can the system allow for retrospective changes *viz* where a payslip has been created incorrectly and has to be re-generated?

Can the system display all the parameters relating to each individual on the screen *viz* name, reference number, gross pay to day, default gross, period of increment of pay, total tax to date, PAYE, code number, National Insurance Class Number, etc?

Can the system produce P45s or, if not, how much does it produce?

Will changes of tax and National Insurance rate affect entries made to the date of the change?

Does the system compute the amounts payable to the Inland Revenue in respect of PAYE and National Insurance separately?

Can it be linked to the financial records so that a record can be maintained of what is owed to the Inland Revenue and what has been paid?

CROSSWORD MAGIC

Maggie Burton reviews a software package that enables you to design and compose your own brainteasers.

Some people like to solve puzzles. Others who are a little more clever prefer to make them up for friends and family to solve.

Crossword Magic will help those smart puzzle-setters to design their own crosswords. It doesn't pretend to help you invent clues or get the grid symmetrical as it should be (incidentally, how many newspaper crosswords these days are symmetrical?), but it's far easier than drawing crosswords out by hand. What's more, it's entertaining and could even encourage people who'd never thought of it before to dig out their dictionaries and start inventing puzzles to mystify and enlighten everyone.

It runs on an Apple II with DOS3.3 and comes on a double-sided disk. Side one is the crossword maker and side two is the player. In the process of making, storing and playing one puzzle, much opening and shutting of drives and turning over of disks goes on. This is a little irritating sometimes but is infinitely preferable to cassettes.

The program is attractively packaged in a hard, plastic-coated booklet containing disk and instructions. This is a good idea as it keeps disk and documentation together in a pack which is hard enough to protect the disk and at the same time easy to store.

After switching on the Apple and shoving the disk in drive one as usual, a display of the program name and author appears for a few seconds and then vanishes, throwing you into the middle of the main crossword maker menu. At this point, if you haven't read the instructions, you should do so — although the program is very friendly to use.

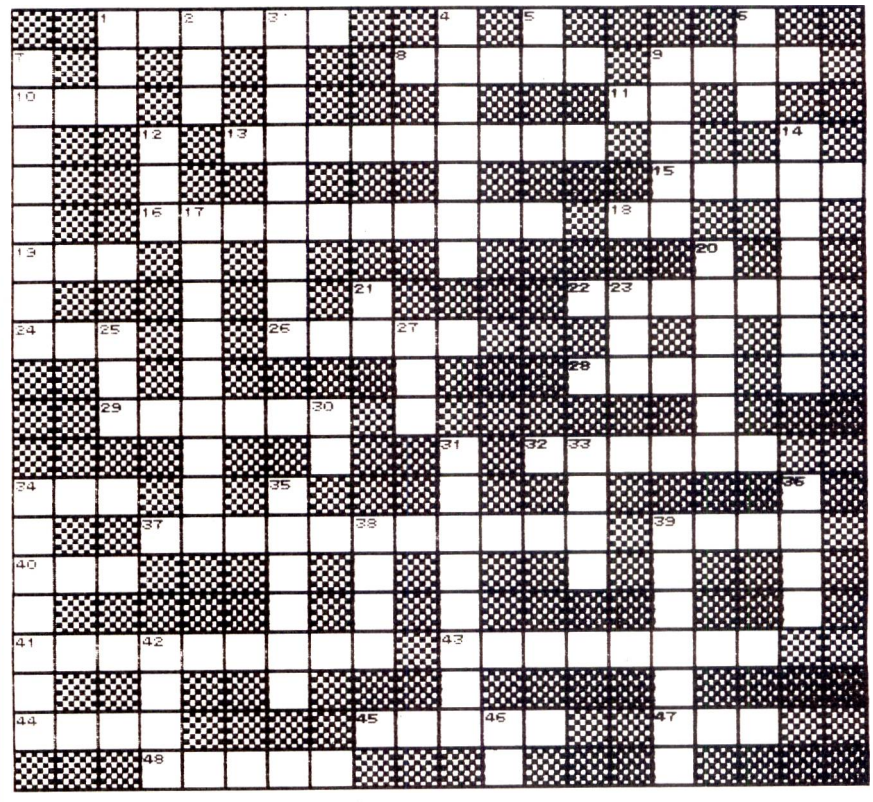
Seven options are provided by the main menu. One of those is that of the existing program; another is to delete a crossword. Then there's 'create puzzle', 'edit puzzle', 'print puzzle', 'transfer puzzle' (ie, move one to another disk) and 'complete puzzle'.

Procedure

It's logical to begin by explaining how a crossword is made. This is naturally initiated by choosing the 'create puzzle' option from the main menu. The first step is to size your crossword. It needn't be square although it must be rectangular. The program defaults to a 10*10 square if you decide to use automatic sizing. Once this has been done the program draws a grid on the screen and you can start to enter words onto the grid.

Words are placed on the grid simply by typing them in and pressing 'return'. The program then locates them in one of (usually) several possible locations. The first word to be entered is always put at the top left hand side of the grid, beginning in the far left corner. Once you have entered a few words you can juggle the whole lot around using control-R (relocate). After you have entered more than about six words (depending on the size of the crossword), you lose the ability to juggle the words around. Only the 'object word' (that which has just been entered) may be moved.

It is here that Crossword Magic's big disadvantage comes to light. It is impossible to delete any word apart from the object word. Now, it is obvious that deleting one word from a puzzle means also deleting all words which connect solely with that word. You'd need some very skilful programming to get a computer to work that one out for you but



ACROSS CLUES

1. SOUNDLESS
8. AROUND AND AROUND IN SPACE
9. FROM MICRO TO TV
10. SOMETHING BELONGING
11. EXIST
13. QUICK TO DEDUCE
15. STRIP TO BIND SMETHING DOWN
16. CONSERVATIVELY NECESSARY
18. ONESELF
19. TINY COLONIAL INSECT
22. DETERMINED IN PURPOSE
24. ABBREVIATION FOR TABULATION
26. RELATED SEQUENCE OF EVENTS
28. THE RESPONSIBILITY
29. FALSE PREFIX
32. IN POOR MENTAL HEALTH
34. FOR EVERY
37. ONE WHO CALLS BACK THE DEAD
39. DISGUSTING. HORRIBLE.
40. SOMETHING TO GO TO WORK ON
41. BOILING WITH ENTHUSIASM
43. FAVOUR FROM ABOVE
44. AGILE SEABIRD
45. THEATRICAL QUARREL
47. PUT INTO OCCUPATION
48. GO INSIDE

DOWN CLUES

1. THE NEAREST STAR
2. EYE COVERING
3. MONSTROUS IN PURPOSE
4. TREASON! THE PERSON WHO TAKES A TEA TRAY ON A GUIDED TOUR
5. USED IN CALCULATING THE AREA OF A CIRCLE
6. WOOD TO BIULD OLD ENGLAND'S NAVY
7. ONGOING: CONTINUOUS
9. A LENGTHY TERM OF HIRE
12. A WELL KNOWN TRADEMARK
14. MAIN CITY
17. FAT,FURRY INSECT
20. THE PRODUCE OF SANE THOUGHT
21. THE END OF A BOXING MATCH
23. WOMAN IN BLACK
25. A SMALL, FLAT LOAF
27. TO REND APART
30. CHOICE BETWEEN OPTIONS
31. THE 'RIGHT' SORT OF BEHAVIOUR
33. SLANG AVERAGE
34. GIFTS TO THOSE WHO WERE THERE
35. DAMAGED; POSSIBLY BEYOND REPAIR
36. POSITIVE SUPERLATIVE
38. AROMATIC HERB
39. DEFECTIVE IN CHARACTER
42. A SERIES OF POINTS
46. DEFINITE NEGATIVE

is would be possible — and very helpful.

It's a good idea to fill the grid as much as possible with longer words first and then type in smaller words towards the end to fill in the gaps. Of couse, you are supposed to fill in as many squares as possible but at any time you can stop entering words and begin composing clues.

You may also abandon your clues and return to entering words. These functions are performed by pressing the escape key to 'view options'. Options are easy to understand and need little explanation.

Clue entry is very easy. The word needing a clue is highlighted and the clue typed in and entered. This is done in the same order as that in which the words were input in the first place. When you have finished entering clues, you are given the option of reviewing them and thus correcting any mistakes you have made.

All in all, composing your own crossword is very absorbing. Using a dictionary as an aid in choosing words and inventing clues is not only helpful — and a bit educational — but it can also help make clues a little more difficult to solve. You'd be surprised how many people don't know the exact dictionary meaning of some quite common words. While constructing your teaser, you may also select one of four display options for the grid using control-B. These are as follows: words can be enclosed in square boxes (rather like an Othello board); blanks can be filled in with fine chequered shading on top of the boxes; you can have no boxes and just shading or neither; making for a very confusing crossword!

At any stage in the design of a puzzle you can stop, save what you've done (as an 'incomplete' file — with the extension 'inc') and pick it up later. Should you be in danger of losing what you've done, the computer will warn you.

The 'edit puzzle' option from the main menu is a rather limited one. It allows you to do no more than change the puzzle name and clues. You cannot change word positioning, nor can you correct a mis-spelled word which you have only then discovered.

When you've finished your puzzle you can print it out immediately or save it for later use.

Final Form

The printouts generated by this system are of a very good quality (even on a Silentype...). The grid is printed (empty, of course) with clue numbers on it, followed (after a pause so you can adjust the paper) by the clues, and then (after another pause) by the answer on a mini-grid. One is printed as part of this review and it comes from a Silentype. We'll print the answers next month...happy puzzling!

Crossword Magic can be used with several different printers. These include Epson MX-80 with graftrax ROM upgrade, Microline 82A and 83A with okigraph ROM upgrade, Prowriter, Itoh, Anadex DP-900 (and others from that range) and several printers from the Paper Tiger range. You also need a compatible parallel interface card to drive the printer. Crossword Magic has to be set up to communicate with your particular printer and the 'print puzzle' option begins by asking you to specify your printer from a list presented to you and then to input your I/O specifications, including the slot number from which the printer is being run. You don't have to change these every time you print, of course, but you do have to see them and make sure they're right.

The last thing to do when you've finished composing a crossword is to exit the program cleanly. Then you can play it (or any other puzzle if you want to) by turning the disk over and booting it by pressing 'ESC'. This side of the disk, the player disk, also gives you a program to format other disks for puzzle storage. The maker disk and any storage disk may contain a maximum of 20 puzzles.

To play a puzzle, the player software is loaded and you are then asked to insert the disk containing the puzzle you wish to play (followed by return to signify that you're ready to go ahead). The computer will then list all the puzzles on that disk, assign numbers to them and ask you to type in the number of the puzzle you want.

Actually playing a puzzle is a bit confusing at first. The left and right arrow keys move you around the grid from one square needing a letter to another. The space bar toggles you between across and down. As you move from one word to another, the clue for that word is displayed below the grid on the screen. Changing from across to down where two words meet also changes the clue.

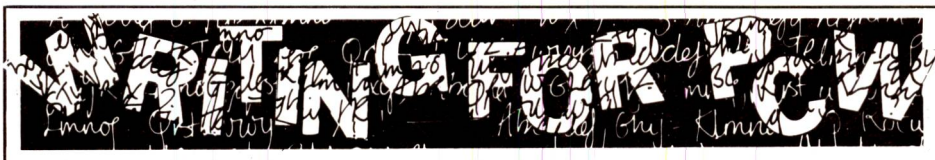
The disadvantage, however, is that you can't delete your input. You can overtype but it's confusing to have filled a few squares wrongly and to be unable to delete what you've filled in. When you've finished doing the crossword, the computer tells you your percentage score. You can also stop halfway through doing a puzzle and save your progress, using your initials as an extension.

Conclusions

Crossword Magic is a lot of fun to use. Because it is the sort of fun software which lasts and lasts, the price of £24.95 — though it may seem pricey at first — is really justifiable.

As with all software, it has its little idiosyncrasies — the lack of an ability to delete, for instance, but it is logically designed and easy to learn. One or two good readings of the instructions are all you need. It's the sort of program which will go down well on family computers — for children it does, in a way, provide real Computer Aided Learning and for adults it is entertaining and fun.

Crossword Magic is directly available from Micro City Ltd, PO Box 54, Norwich NR2 1SZ. Tel (0603) 25648. END



PCW welcomes approaches from would-be writers, even those who have never appeared in print before. In this game it's often those with practical experience who have important things to say so we don't mind if your prose is less than perfect — providing submissions have a sensible structure and follow a logical sequence, we can take care of the polishing.

If your article is already written, send it in — taking care to ensure that your name and address, together with a daytime phone number if possible, appears on both the covering letter and the manuscript. Manuscripts should, preferably, be typed or printed out (dot matrix output is quite acceptable) but *must* be double line-spaced with ample margins top and bottom and on each side. Make sure you keep a copy of *everything* you send us.

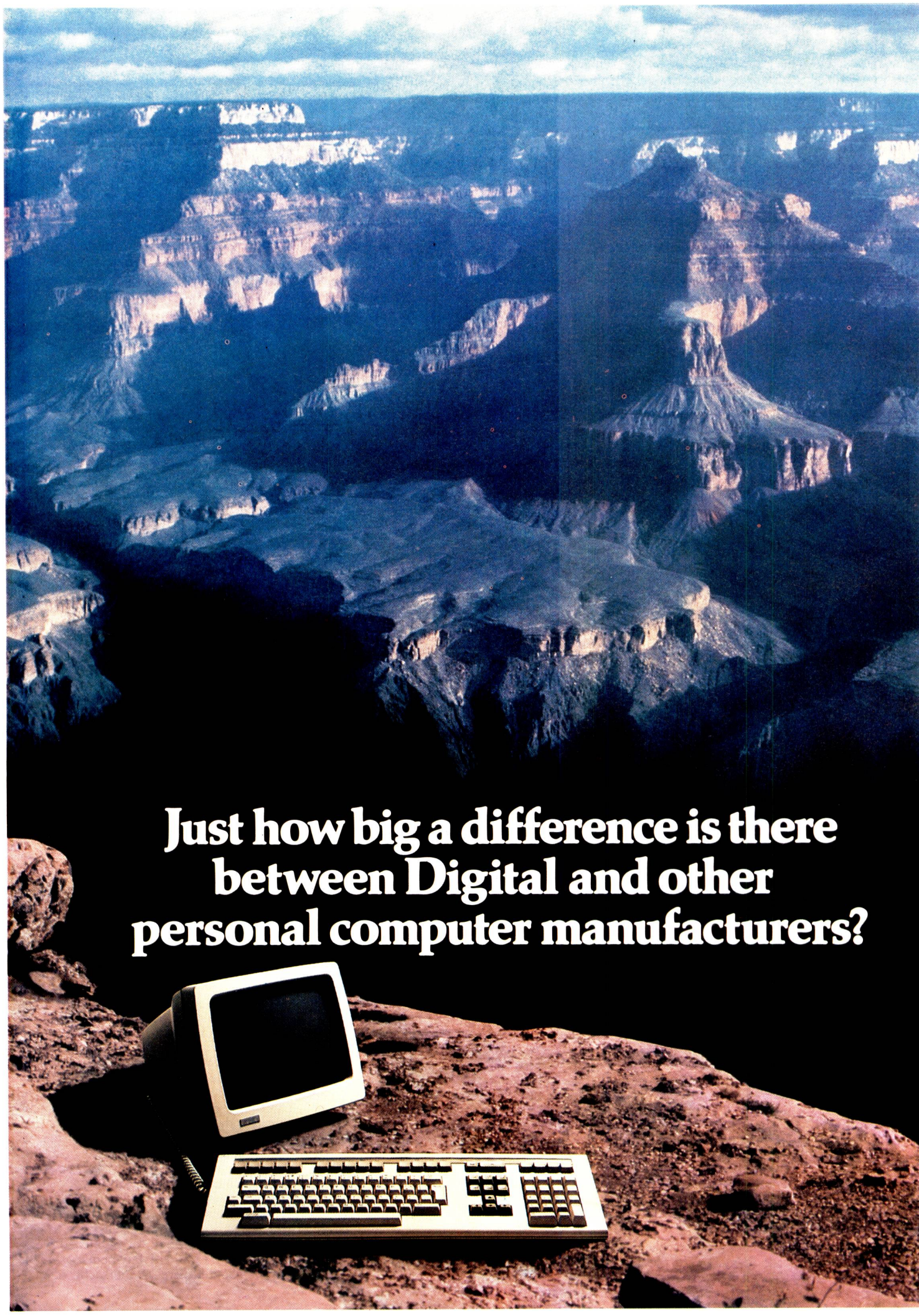
We can now accept articles on a limited number of disk formats: standard IBM 3740 single-sided, single-density 8in, and the following 5¼ in formats: Superbrain SSDD 35-track; RML 380Z SSSD; Sharp MZ-80K/A DSSD, Cromemco SSSD, Nascom DSSD, Rair/ICL DSDD, SD Sales SSSD, Triton 35 track SSDD and ACT Sirius 1 (CP/M-86 or MS-DOS) single-sided. By prior arrangement we can accept stuff over the phone by modem using BSTAM at 300 baud but as we can only do this during office hours (10am to 6pm) it's not exactly a cheap way of getting your article to us! In the near future we hope to be able to accept material by The Source and Rewtel. Please note that if you want to send your article in this way, it should be as an ASCII file rather than as a 'work file' for any one type of word processor — ie, use your word processor to print the text to disk instead of to paper.

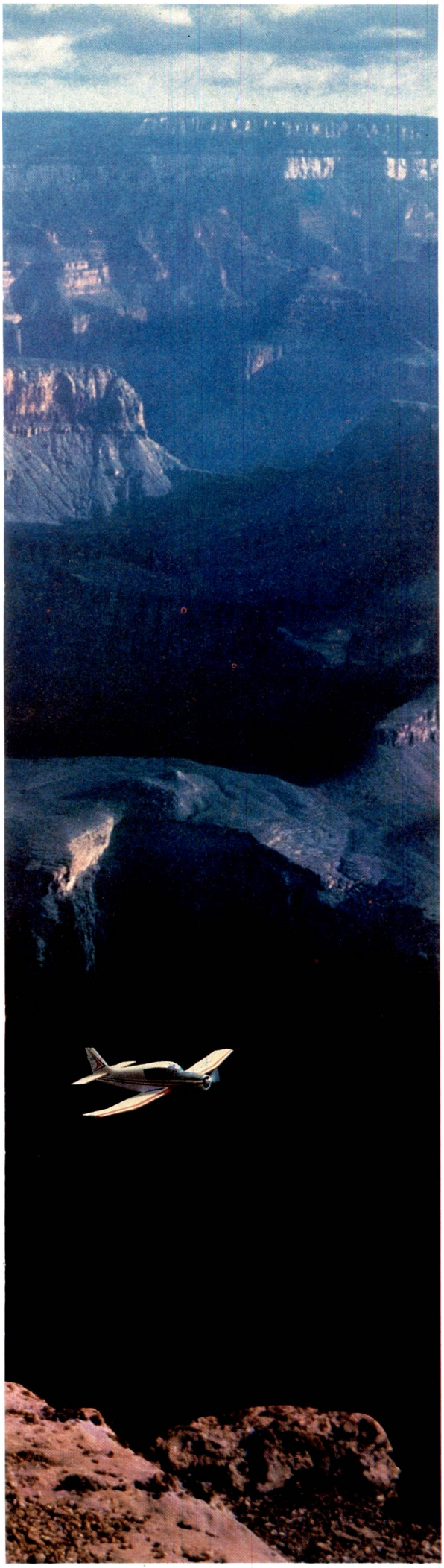
Please note that we cannot undertake to return manuscripts, diagrams and photographs, although we always try to return the latter. We can only return disks if they are accompanied by adequate postage *and* packaging.

If you have an idea for an article or a series, write us a letter outlining your ideas. A one- or two-page synopsis giving the proposed structure, sequence and content is what we're looking for. But before you send anything to us, take a good look through *PCW* to see what sort of articles get published and to see what style of writing we prefer (basically, avoiding promposity at one extreme and flippancy at the other). Also take a look through the Back Issues advert to see what sort of things we have already published — no point in re-inventing the wheel.

Once you've sent off your article or proposal, please don't hassle us for a decision. We receive far more submissions than we can ever use and it takes us a while to sort through them, acknowledge receipt and give an opinion one way or the other. Please be sure to tell us if you've sent the article to another magazine — it would be very awkward indeed if the same article appeared simultaneously in two publications! Frankly, we're more likely to accept something which has been offered exclusively to us.

Finally, we do pay for published work but please be patient! Payment *normally* follows about 4-6 weeks after publication.


Just how big a difference is there
between Digital and other
personal computer manufacturers?



The gap, believe us, is wide.

And the confusion surrounding personal computers, widespread. Because the term 'personal' computer now stretches to include a multitude of machines, with a diverse range of functions and capabilities.

So let's set the record straight. And get down to business. Over the past quarter century Digital's main objective has been to personalise the computer. Permitting direct access to *real* computing power to whoever wants it.

And in that time Digital have introduced minicomputer power into banks, mines, steel plants, farms, refineries, aviation, broadcasting, universities and assembly lines to name but a few.

Digital were also the first company to mass produce minicomputers, and the PDP-11 is, in fact, the world's most popular minicomputer today.

A fact that makes Digital the world's largest manufacturer of minicomputers. Which, in turn, makes it less of a surprise that Digital have now developed a range of personal computers unrivalled in their ability to meet today's professional requirements. From the dual microprocessor Digital Rainbow to the highly advanced Digital Professionals, the first personal computers with the ability to perform numerous functions at once, there's a Digital personal computer to suit practically any need.

And the Digital difference becomes even wider when you consider Digital's unique service back-up, which includes access to our Customer Information Centre, service support, software services and maintenance. And in the unlikely event of anything going wrong, Digital guarantee to deal with any problem, on site, within 8 working hours anywhere on the UK mainland.

Plus you automatically get a free 12 month warranty to cover all our hardware and software.

It's a service record that is, in fact, unrivalled by any.

If you'd like further information about Digital professional personal computers ring Digital on Basingstoke (0256) 59200 or contact any of the Dealers shown overleaf, then compare the facts with any other machines to see just how wide that chasm of difference really is.

You'll end up on our side every time.

Doing more. The Digital difference.

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Where to find your nearest Digital Authorised Personal Computer Dealer.

LONDON

Beauchamp Computer Systems Ltd.,
115 Fulham Road, London SW3.
Tel: 01-581 8134.

The Computer Terminal, 44 Cathedral Place,
London EC4. Tel: 01-236 2187.

Demotab Ltd.,
99–101 Regent Street, London W1.
Tel: 01-439 3971.
(Market Research & Advertising Agencies).*

Guestel Ltd., 6–12 New Bridge Street,
London EC4. Tel: 01-583 2255.

Matmos Electronics Ltd.,
14–16 Child's Place, London SW5 9RX.
Tel: 01-373 6607.
(Opticians & Opthamologists).*

Micro Business Systems PLC, Cannon Street,
London EC4. Tel: 01-621 1122.

Personal Computers Ltd., 220–226 Bishopsgate,
London EC2M 4JS. Tel: 01-377 1200.

Planning Consultancy Ltd., 46/47 Pall Mall,
London SW1Y 5JG. Tel: 01-839 3143.

Rank Xerox (UK) Ltd., The Xerox Store,
84 Piccadilly, London W1V 9HE.
Tel: 01-629 0694/5.

The Xerox Store, 110 Moorgate,
London EC2M 6SU. Tel: 01-588 1531/2.

The Xerox Store, 76–77 Holborn,
London WC1V 6LS. Tel: 01-242 9596/7.

Software Sciences, Thorn (EMI) House,
14 Old Park Lane, London W1. Tel: 01-499 7099.

Software Sciences, 88 Old Street,
London EC1. Tel: 01-253 1480.

Sumlock Bondain Ltd., 263–269 City Road,
London EC1V 1JX. Tel: 01-250 0505.

Sytec Products Ltd.,
25 Bruton Lane, London W1. Tel: 01-409 1244.
(Pressure Vessel Design, Surveying,
Structural Analysis).*

HOME COUNTIES

Dataview Ltd., Portreeves House, East Bay,
Colchester, Essex CO1 2XB. Tel: 0206 865835.

Ferrari Software Ltd., 683 Armadale Road,
Feltham, Middlesex. Tel: 01-751 5791.

GSI Ltd., Stanhope Road, Camberley, Surrey.
Tel: 0276 62282.
(Motor Dealers & Manufacturers).*

Key Computer Centres, Enterprise House,
Terrace Road, Walton-on-Thames, Surrey.
Tel: 09322 42777.

Micro Business Systems PLC,
119–120 High Street, Eton, Berkshire.
Tel: 07535 55211.

Microfacilities Ltd., 7–9 Church Road,
Egham, Surrey. Tel: 0784 31333.

Rank Xerox (UK) Ltd., The Xerox Store,
3/4 William Street, Slough, Berkshire SL1 1XY.
Tel: 0753 76957.

AUTHORISED
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PERSONAL COMPUTER
DEALER

STC Micros, West Road, Harlow,
Essex CM20 2BP. Tel: 0279 443421.

Sytec Products Ltd., Cord House,
The Causeway, Staines, Middlesex.
Tel: 0784 63911.

SOUTH/SOUTH EAST

Bartholomews Business Systems Ltd., Portfield,
Chichester, Sussex. Tel: 0243 775111.
(Agricultural Suppliers, Farming).*

Computerland
(Sperrings Computer Shops Ltd.),
Spencer House, 12–14 Carlton Place,
Southampton. Tel: 0703 39571.

Software Sciences, Abbey House,
282–292 Farnborough Road, Farnborough,
Hants. Tel: 0252 544321.

South East Computers Ltd., 15 Castle Street,
Hastings, Sussex. Tel: 0424 426844.

South East Computers Ltd., 31 Watling Street,
Canterbury, Kent. Tel: 0227 59917.

South East Computers Ltd., 29 High Street,
Maidstone, Kent. Tel: 0622 681263

SOUTH WEST

Computacenter, Theatre Square, Swindon,
Wiltshire SN1 1GN. Tel: 0793 612341/2.

Rank Xerox (UK) Ltd., The Xerox Store,
Bristol & West House, Broad Quay,
Bristol BS99 7AX. Tel: 0272 277828.

Software Sciences, Unit 39, Southfield Road,
Nailsea, Nr. Bristol. Tel: 0272 851462/3.

South Coast Computers Ltd.,
South Coast House, Wimbourne Road,
Ferndown, Dorset. Tel: 0202 893040.

Whymark Computing, 20 Milford Street,
Salisbury, Wilsthire SP1 2AP.
Tel: 0722 331269.

MIDLANDS

4B Microcentres Ltd., 13/14 North Bar, Banbury,
Oxon OX16 0TF. Tel: 0295 66555/50796.

Micro Business Systems PLC, Wirksworth,
Derbyshire. Tel: 062-9823120.

MMS Ltd., Ketwell House,
75–79 Tavistock Street, Bedford MK40 2RR.
Tel: 0234 40601.

Zygal Dynamics PLC, Zygal House,
Telford Road, Bicester, Oxon OX6 0XB.
Tel: 08692 3361.

NORTH EAST

Microware Computers Ltd., Diamond House,
Whitelock Street, Leeds. Tel: 0532 434377.

Microware Computers Ltd., Priory House,
1133 Hessle High Road, Hull HU4 6SB.
Tel: 0482 562107.

Whessoe Technical & Computing Systems Ltd.,
Brinkburn Road, Darlington,
Co. Durham DL3 6DS. Tel: 0325 60188.

NORTH WEST

Cytek (UK) Ltd., Sandringham House,
9 Warwick Road, Old Trafford,
Manchester M16 0QQ. Tel: 061-872 4682.

Micro Business Systems PLC,
Birchwood Science Park, Warrington.
Tel: 0925 822261.

Rank Xerox (UK) Ltd., The Xerox Store,
Pearl Assurance House, Derby Square,
Liverpool L2 9QR. Tel: 051-236 7512.

WALES

Rank Xerox (UK) Ltd., The Xerox Store,
South Gate House, Wood Street,
Cardiff CF1 1EW. Tel: 0222 40118.

Sigma Systems Ltd., 266 North Road,
Cardiff CF4 3BL. Tel: 0222 34865/69.

SCOTLAND

Micro-Centre (Complete Microsystems) Ltd.,
30 Dundas Street, Edinburgh EH3 6JN.
Tel: 031-556 7354.

Micro Business Systems PLC,
Turnhouse Airport, Edinburgh.
Tel: 031-333 1000.

Pilgrim Business Machines Ltd.,
28 Walker Street, Edinburgh.
Tel: 031-226 5528.
(Solicitors).*

Pilgrim Business Machines Ltd.,
Northfield Place, Aberdeen. Tel: 0224 645104.

Rank Xerox (UK) Ltd., The Xerox Store,
166 Hope Street, Glasgow G2 2TG.
Tel: 041-333 0495.

NORTHERN IRELAND

Systems Plus Ltd., 19 Glengormley Park,
Newtownabbey, Northern Ireland.
Tel: 023-134 2117.

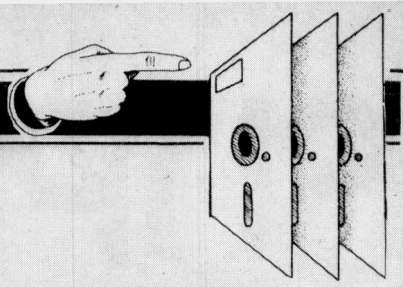
DIGITAL UK HEADQUARTERS

Digital Equipment Co. Limited, P.O Box 110,
Reading RG2 0TR. Tel: 0734 868711.

*Vertical market application speciality.

digital

PACKAGES



PCW's 'Packages' section is produced bi-monthly, alternating with our 'In Store' hardware guide. We have confined coverage to business packages which are available and supported at national level and which have been in use for at least six months in a minimum of five sites. Producers of packages which fall within these constraints should send details or updates to: **Dick Olney,** *PCW,* **62 Oxford Street, London W1.**

The layout has been designed to allow you to 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

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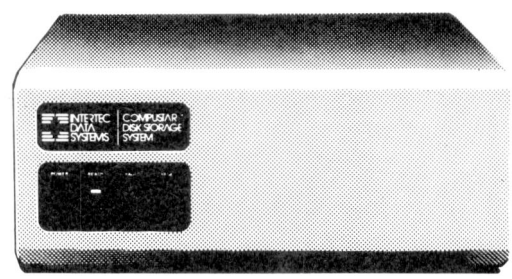

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PACKAGES

Application	Machine	Price	Code
	Apple II	£300	S5
	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 1	£225	H1
	Tandy Model 1	£225/325	T1
	Tandy Model 11	£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 I	£265	O1
	Act Sirius I	£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 1	£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 I	£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

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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/ Word processing	£225	H4
		£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
	Production 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	£99	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

BUILD A BETTER BRITAIN WITH C-D-S (UK) MICRO

IMPORTANT ANNOUNCEMENT

TO ALL U.K. MICRO COMPUTER PEOPLE

A national scheme for local community developments and business initiatives is being set up, which will be of great interest to everyone involved with home/micro computers and ancillary equipment, whether they are students, enthusiasts, users, designers, distributors or manufacturers.

The scheme is called C-D-S (UK) MICRO and it offers considerable opportunity for large scale supply of hardware, the design and production of special programs software, and unique commercial activity. Micro compuer users can set up dynamic C-D-S management projects in their own immediate local area as profitable business enterprises.

For general information about the scheme, together with schedules, plans, programs and specifications please send £5.00 (users) or £20 (suppliers & distributors) to: **C-D-S (UK) Micro, 89 Hexthorpe Road, Hexthorpe, Doncaster DN4 0BE.**

MAKE YOUR MICRO EARN ITS KEEP – AND YOU A GOOD BONUS INCOME

ALSO:
Membership applications are now invited for registration with the new

PUT YOUR IDEAS, AMBITIONS AND INTERESTS INTO PRACTICE IN PARTNERSHIP WITH C-D-S

NATIONAL C-D-S (UK) MICRO ASSOCIATION

Providing job opportunity, full or part time, and special provision for area and regional management positions. Direct participation *must* have prior association registration. Payment of registration fee entitles direct members to take up area, regional or national C-D-S SHAREHOLDING. For full information and Association literature, send fee as:

NCDS (UK) MA MEMBERSHIP REGISTRATION FEES

Users (Individual)	**£15.00**
Students	**8.00**
Clubs or Groups	**5.00 per member**
People interested but non technical participation	**3.00 (for info)**



To:

COMMUNITY SYSTEMS (UK) C-D-S

89 Hexthorpe Road, Hexthorpe, Doncaster DN4 0BE, South Yorkshire

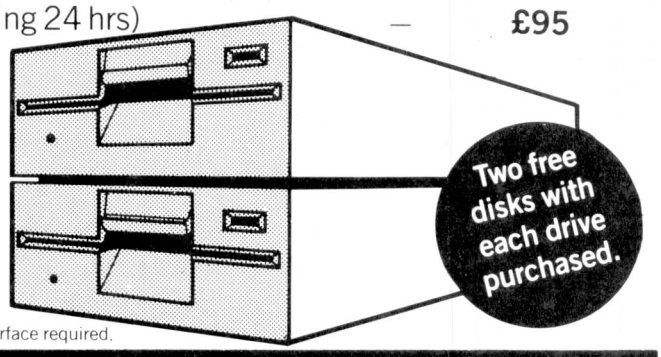
BUILD A BETTER BRITAIN WITH C-D-S (UK) MICRO

MICROAGE ELECTRONICS

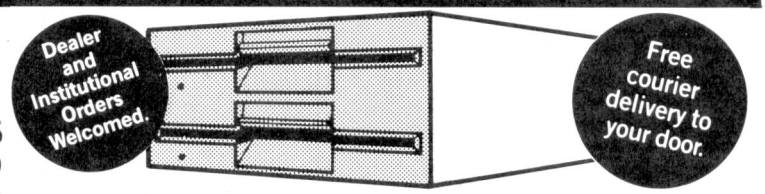
FOR THE BEST DEAL ON BBC MICRO DISK DRIVES

Microage of Edgware - Acorn's largest dealer- now bring you the most powerful range of disk drives for your BBC Microsystem B.*

A	BBC Compatible Single drive (100K) –	**£235**
B	BBC Single drive (100K) –	**£269**
C	BBC compatible Dual drives (200K) –	**£389**
D	BBC compatible slimline Single drive (400K) –	**£399**
E	BBC compatible slimline Dual drive (800K) –	**£799**
F	BBC Disk Interface (inc 1.2 ROM & fitting 24 hrs) –	**£95**



*Disk Interface required.



All drives are fully compatible with the BBC Micro and are complete with full manual, utility disk and connecting cables. Remember these are top quality products manufactured by TEAC Siemens and Mitsubishi. All prices include VAT.

Open Mon-Sat 9.15- 6.00 Thurs 9.15-1.00 Send this coupon in to obtain a 5% discount on all products (excluding B & F).

To: Microage Electronics, 135 Hale Lane, Edgware Middlesex HA8 9QP

Please send me qty. A ⌊_⌋, B ⌊_⌋, C ⌊_⌋, D ⌊_⌋, E ⌊_⌋, F ⌊_⌋

at total cost of £_____. I enclose cheque no:

Or debit my Access/Barclaycard No. ⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋⌊_⌋

Signature _____

Name _____

Address _____

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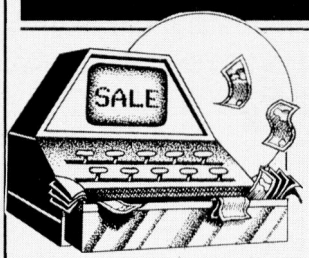
Postcode _____ Telephone _____ **PCW/6/83**

MICROAGE ELECTRONICS
135 HALE LANE EDGWARE MIDDLESEX HA8 9QP TEL: 01 959 7119 TELEX 881 3241

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 1	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.

● New brain AD portable computer with built in display. As new with standard manual + beginners manual + tape. Excellent condition. Only a few months old, £230. Tel 01-641 3650 eves.

● 16k Vic 20 cassette recorder. Super expander, Rat Race cartridge, joystick. Introduction to Basic part 2, £40 of software. Cost £400+, only £300. Tel 0227 793486.

● Atari 800 with cassette recorder, and josticks + Basic and Star Raiders cassettes, and manuals cost £500 at christmas, will swap for BBC B. Tel 07535 62321.

● Sharp MZ80 K. 9 months old, with £100 of Kuma software including Wd Pross, Chess, Othello, Adventure. Cost £480 offers! Tel 789 9872. Also Sharp interface for Epson MX80 FT3 printer £38.

● ATOM 64k, boxed excellent condition. Programs: Invaders, Snapper, including PSU. A snip at £2.50. Tel Harrogate 503079 after 6 pm. Write Mr. Vincent, 2 Dutchy Grove, Harrogate, MG2 0ND, North Yorkshire.

● Osborne one, virtually unused only 3 months old! complete with manual and software, Wordstar and Supercalc etc. *Bargain* £865 + VAT. Tel 01-904 4450 Wembley.

● Acorn ATOM 12k RAM fitted with BBC Basic ROM, giving choice of Atom or BBC Basic. 5V3A PSU leads manuals. £140. Tel Northampton 32287 daytime or Leire 209666 after 7pm.

● Sharp PC-1211, printer-cassette, case, Sanyo M1001 recorder, mains adaptor, spare paper, batteries, full program library on cassette inc. Statistics, Financial, Games, Addressograph, Graph-plotting utilities. The lot £100 061-789 2408.

● Sharp MZ-80K and software. Includes dust cover. One year old and in excellent condition. Hardly used. £320 ono. Tel Huddersfield 510817 after 5pm any day. Urgent sale required.

● Atari 800/48k ZX810 disc, 410 cassette, 850 interface, centronics 739/11 printer. Joysticks. Range of software inc. Visicalc, Stock control, Personal Finance. Games. £1200 ono. As new. London 01-958 5600 anytime.

● ZX81 + 16k + 4k graphics ROM. (Sinclair/Kayde built). Pimania, Centipede, Super Balloon etc. Worth £150. Will sell for £80. For further details tel Fraserburgh 5536 between 4 and 10pm. (Quick sale needed).

● MZ80K. Quest For The Sceptre, graphical adventure game, Travel Through Marchenland To Find 6 Signs. Send cheque for £6 to W J Cage, Orchard House, Freemans Close, Stoke Poges, Bucks SL2 4ER.

● ZX81 with 16k RAM factory built. Hardly used leads, manual, and software + ZX computing mag Summer 82. Offers for quick sale. Tel 01-874 9111 (eve) + weekends.

TRANSACTION FILE

● Sorcerer 56k + Basic ROM pack, W/Processor, several games and leads only £375. Contact Barry 01-455 0310 work 01-441 5266 home.

● Acorn ATOM 12k RAM 8k ROM. All leads, manual and plenty of software incldiung Invaders Star-Trek and Asteroids £150. Tel 01-950 3262 (Bushey) eve.

● Sharp MZ80K 48k complete with Basic manual + "Valley" tape. Can delivery 30 mile radius Stevenage. Please contact J W Newton, 25 Holly Leys Stevenage, Herts. Tel 0438 57027. First £250 no offers.

● Microline 80, Brand new, unused in box. Only £229 including 2 rolls of paper. Dragon/BBC cable £15. Delivery free in UK. M. Hughes 57 Repton Drive, Haslington Crewe, Cheshire (0270) 582301.

● TRS-80 LII 32k expansion interface; lower case, 12in green screen monitor, printer VII, tape recorder, sound box, dust covers, £250. Software. All cables & manuals. £950 ono. Tel 01-950 3621 eve.

● Sharp MZ-80B expansion unit. 2nd graphics, RAM, Pascal CPM. Just add discs for a powerful system. Tel Pat Carpenter 01-551 2634 after 6.30pm and week ends £710 ono.

● Apple II+ 64k including RAM-card, color card, TV modulator, cassette, software, manuals, paddles. Only £450 ono Tel 0604 858395.

● Sharp MZ80K 48k RAM with manual. Various programs incl. Knights Commander, Database, Cribbage, Othello, etc. £330. Buyer collects. 01-850 9020.

● CBM 4032 + cassette deck, toolkit and arrow chips. 75 progs including Petchess and Papermate + manuals. Excellent condition. £450 no offers. Harrogate (0423) 771139 after 6.0 pm.

● Word processing system: 64k Superbrain, Diablo precision, Daisy-wheel, spellbinder, Wordstar, many disks, Microsoft Basic Complete, practical. All manuals, £32500 ono. 0252 514060 eve 0932 5330 Ext 266 days, John Taylor.

● Superboard II 8k RAM with 32x48 video, Cegmon, 8k expansion with PIA + 8in SSSD disk drive with premier interface, + odd bits. £250. ono. Can split. Burbage Wilts Tel 0672 810858.

● PET 2001 8k, small keyboard, cassette, monitor, books, software. Excellent condition. £275 ono. N Hall 0482 66 7957 after 6pm.

● 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 £525 ono. Tel Northwood 22558.

● UK101 professionally built 12k. Basic, Cegmon, toolkit. Some software. Lots of documentation, uncased hence price £95. Including postage. Tel Fordingbridge (0425) 52718 after 6pm.

● Printer dot matrix. Tractor feed. RS232/TTL switchable baud/parity. Suit Newbrain/UK101/Superboard etc. £100 P Cooper, Queensmere Lodge, Maldon Road, Bradwell-on-Sea, Essex. Tel Maldon (0621) 76320.

● PET 4032, Visicalc, toolkit, manuals cover, 14 MTHS. VGC £475. PET 2031 disk drive, year old VGC. Disks programs £300. Epsom MX80FT printer, Interface, cables £300 All £1000 G Defries 01-4401553.

● Visicalc and Visitrend/Visiplot for Apple II + Selling for £40 each ono. Write R. Wong, Deanscroft, Station Road, Oakham, Leics LE15 6QG.

● ZX81 16k machine code games: Asteroids, Invaders, Scramble, Galaxian, Defender £1.50 each. Puckman, Phoenix, Krazy-Kong, Frogger £2.00 each. G. Stoneman, 1 Tarnside Road, Orrell, Wigan, Lancs WN5 8RN (No personal callers!).

● PET 20085 £150.00, Sharp PC1211 printer and cassette £150.00. Casio 501P £35.00. Commodore navigation calculator £25.00. A language translator £30.00. Casio Music Calculator £25.00 For more details Tel 0224 713675.

● Sharp MZ80K 48k RAM Quantum HI-RES (320x200) + Seikosha GP100A, interface 4MHz + reset switches, external video controls, Assembler, Fig-Forth, manuals, Chess, Asteroids, etc. £450 Tel Tim (0482) 865923 after 6pm.

● FX702 pocket computer, + printer + cassette-interface. Instruction manual. Like brand new. All for £130. Tel 01-578 3420 after 6 o'clock call Mohmmed.

● Sinclair 48k Spectrum. ZX printer. 10 rolls of paper. Vu-calc horizons, Microl use and learn tapes. Leads, manuals, power supply. £200. Tel 07917 3791. (Andrew Michael).

● ZX81 + 16k RAM Sinclair built with all leads etc. Manual and 2 books + 2 cassettes £65. Tel eve 01-866 1596.

● Seikosha GP80A printer. £135 ono. Video Genie with lower-case £120 ono. Perfect condition. Tel 01-340 2318 N. London.

● TI-99/4A only 2 months old. With 16k RAM, hires, colour and sound + 6 ROM modules worth £130 and cassette lead manuals. Altogether worth £330; will accept £225. Tel 061-226 9955.

● Sharp MZ-80K 48k, 1 year old, includes books, user notes, joystick, and software, value £400+ Wordpro, Calc, Forth, Database, Sargon, Draughts, Bridge, The Valley, etc. £375 ono. Tel 0908 677508.

● Acorn ATOM 12kRAM 14k ROM, via + FP. 2k toolkit PSU, TV lead, manual. £140 or offer. 061-427 7128.

● Sharp MZ-80K 48k with Hi-Res Graphics, (64,000 DOTS), with much software (Education and Games). All for £325. Tel Mr PC Lee, eve/weekend or write to: 200 Stanley Road, Teddington, Middx, TW11 8UE.

● TRS-80 LII 16k VDU CTR80 cassette. All leads and manuals + software. Also technical manual and machine code manual. As new. £290 ono. Tel Fulston (050786) 622.

● VIC-20 with cassette unit. 16k RAM pack, joystick, manual, over £70 of games. All for £198 ono. Tel 028-577 476.

● Acorn ATOM. Atom Basic, + BBC Basic, 6k graphics, 14k text, FP ROM + utility ROM, external sound generator with 2 I/O ports, 5A PSU £250 ono. Tel 0506 871625.

● Wanted disc drive for use with BBC model B under £100 preferred, + leads. Derby area. Tel 0332 773865 and ask for Jim.

● Sharp PC1211 Hand held computer. 2k RAM. Great for college/university school. Immaculate condition. Hardly used. 3 manuals, keyboard, templates. Boxed as new. Will deliver. Only £45.00 ono. Tel 0494-39283 after 7. MZ-80K £340.

● Sharp MZ-80K 48k. Immaculate condition, little used. Loads of software, 5 Basics, Forth, Stock Control, Adventures, Galaxians etc. Dustcover. Club newsletters. Boxed as new. Only £340, will deliver Tel 0494 39283 after 7.

● VIC-20, memory expanded, VICgraf cartridge, ordinary tape recorder, interface, dustcovers and books. 5 months old, excellent condition. New £310; will accept £260. Tel Ashraf, at 061-881 8091 after 7pm.

● ITT2020 48k. Manuals, books, magazines, software, disc drive, DOS 3.2/3. card, £550 ono. For both Tel Rayleigh (0268) 778686 eve or weekends.

● PET 2001 8k old ROM. Integral cassette; programmers 'toolkit', handbooks, tutorial tapes, £195 buyer collects or pays petrol if delivered. Tel Wickford (Essex) (03744) 2791. Peter Smith.

● Epson MX100 printer with Centronics parallel interface suitable for most micros. 100 CPS + full width paper. Demonstration model less than 3 months old £430 inc Tel Dorothy North 0923 31289.

● CBM calculators PR100 programmable £20.00, SR1800 scientific £10.00, GL997R Basic four function £7.50. All excellent condition with mains adaptors Tel 0734 698094 eve.

● VIC20 printer £120 ono. Also software including programming cartridges Vicfile, Vicwriter, Simplicalc, Hesbal Editor/Compiler, Accounts + games. All approx half price. Tel Caterham 47320 eve.

● PET 32k 9in Screen. Dustcover, external cassette. Excellant condition. Rev 4.0 ROMS Price £400 Tel Edinburgh 332 6406 after 6.30pm.

● TRS-80 16k L2 with cassette recorder, manuals, books, software (Assembler, T-Bug, games, etc). £230 ono. Tel Chris Timms, 01-555 3299 extn 2629 (day), 01-650 7735 (eves and wkds).

● TRS80 16k L11 with tape recorder, manuals and software. Adventure games, Chess, Space Invaders etc. £150.00. Also VDU For sale green screen. TRS model. £50.00. Tel after 2pm 05255 3300.

● Atari VCS with 15 cartridges including Donkey Kong, Defender, Berzerk, etc. All in perfect condition in original boxes. Reasonable offers considered. Call Cobham 5847 after 4.00 or on weekends.

● Tangerine Micron 8k RAM. Microrosoft Basic, M/code Assembler, Parallel and serial interfaces £190 Tel Tibberton 325.

● Microline 80, Computech improved lower case character generator with pound sign, Roll of paper, as new (original packing), manual, Centronics interface 6938975 (London) £190 ono.

● ZX81 + 16k RAM + printer. New. Cost £130. Accept £90 ono. Leamington Spa (0926) 27201 eve or weekend.

● Sharp MZ-80A business programs. Wordpro, Stock Control, Finance, Invoices, Databank, also games, educational and utilities. SAE for list of MZ-80A and MZ-80K cassettes. 38 South Parade, Bramhall, Stockport SK7 3BJ.

● Telex printer KSR Stand and Transformer, working order very good condition. Keyboard printer and paper tape loop interface for many micros £90 Ward 01-486 9893 Viewing in Central London.

● Sharp MZ-80k 48k with Forth, Pascal (2), Assembler extended Basic and many programs including Chess, Database etc 5 books, users notes. £425 ono. Tel Leven (0333) 26703 after 6pm.

● Atari 800 16k + cassette, manuals, books, listings, J/stick, paddles — £390 Tel 01-393 0116 ask for Tim.

● UK101 8k full keyboard 300/600 Baud cased. Cegmon monitor, 100% reliable, built in programmable sound unit, including over 100 programs Mic Invaders and television only £120. Tel Ipswich 0473 213570.

● Selectric keyboard printer, EX2741 with hardware/software interface for Z80 micro +P10, runs with Nascom 2. Previously IBM maintained, some manuals. £450 ono. Tel Ipswich (0473) 831353.

● UK101, cased, SKRAM, 24 line I/O port, light pen, external PSU, 3 games, video 100 VDU £160 ono. Also 610 expander board with 24k RAM £150 Tel 01-390 0156 (Surbiton).

● Apple 80-column Videx card and manual. Bargain £85 ono. Mr Driver 01-578 4313 extn 284 (days) Dorking 730552 (eve).

● Newbrain AD Never used all manuals, leads, immaculate £170 Tel Brimscombe 882711 eve or Bath 28331 ext 740 day ask for Derek.

● Disk Drives for sale, 2 8in DRE 7200 double sided double density drives, 3.5MB unused in original packing £500 ono. Tel Paul Ellis 01-908 0411 Ext 58 or 01-543 1857.

● S100 bus 8k Static RAMS Ex North Star Horizon 5 Boards available. Offers office hours. Tel 01.735 5126 otherwise 01-452 2098.

● UK101 8k RAM uncased wemon 2MHZ 300/600 baud sound software inc. M/C Asteroids Disass. Good cond. Fully documented £110.00. ono Tel Matthew 0775 88 383 eve.

● Acorn Atom 12k RAM 12k ROM includes PSU, manual, toolkit, EPROM and printer interface. Also various Atom books + some games software on cassette. £185 Tel Horley (02934) 73524 eve.

● Acorn Atom 12x12k colour, Tape, Floating point, software cost £350 + must sell, redundant. Rarely used. Offers please Circa £270+ 2 Templars Close, Witham Essex.

● Superboard II, 16k RAM, 300/600 baud cassette, 2MHz, cased 48x32 screen, Cegmon and Basic four. Software includes Assembler, Exmon, 3 Adventures, Invaders and Othello. Only £100 Tel Tottington 5338.

● "Last One", Applewriter, Dataplan, back copies Windfall, books, discs, printer, paper, games etc etc. All for £300 (Apple) Tel 0981 5407:4 or 0981 540061. Huge bargain pile.

● Burroughs B80 64k, 2 8in Disc Drives, 2 cassette drives, 60CPS printer console with function keyboard, 250 Lines/Min line printer, Logic diagrams. £500 ono. Space required. Buyer removes. Tel 0530 414383 eve.

● Buy used programs running CP/M Pascal, Integer, Applesoft, Cbasic. Including Copy programs, micro planner dBase II family, Wordstar family Visifamily compiler. Material handling project costing. Write Peter Andersen, 41 Naesbyvej, 8270 Hokbjerg, Denmark.

● Microtan 65, Tanex, 8k RAM, XBug 5.5, professional 82 key keyboard, PSU, hex keypad, 13 tug newsletters, games programs, Pixel graphics, leads, manuals, All for £130. After 5pm 66 North Walls, Stafford, Staffs.

● Texas TI59 with PC100C printer. Excellent condition complete with all manuals, spare paper, cards, etc. For quick sale at well under half price £150 ono. Tel Wokingham (0734) 788110 (eve).

● Video Genie EG3003 16k modified keyboard. Bionic ROM, lower case, sound etc Lots of software and books. £195 ono. EG100 12in monitor £50 ono. Tel I D Green Ruislip (08956) 76012.

● PET 3032/32k new ROM: Hampshire's PET Revealed, manuals, programs-assembler/dissassembler, Word Processor, games: £300 or any offer. Bob, 17 Aled Drive, Colwyn Bay. Could deliver from Liverpool 0492 40780.

● Sharp MZ80K 48k RAM + I/O box with RS232 interface + Sharp Assembler. 12 months old, mint cond. Best offer over £400. Will separate. Tel 01-992 1268.

● TRS-80 16k LII, boxed, excellent condition £150+ software, books, mags, and tape player £160ono. Also Aculab floppy tape + manual. As new. £100 ono. Tel 07014 61563 (Hampshire).

● S100 16k Static RAM cards. 250hS. Cost over £200. (£65). S100 homebuilt cabinet, 9 slot, £75. The Byte book of Pascal, hardback, new condition, cost £20 (£12) Tel (0670) 829215.

● Decassette TU60 with PDP11 interface and maintenance manual £150. Tel Portsmouth 385589.

● TRS80 model 1 48k, cost £2000+ adapated for high resoltuion graphics. Disk drive, Centronics 132 column printer, software includes Basic compiler, Editor, Assemblers, Database Systems Cyberchess, £1000 ono. St Agnes 3368.

● PET 32k, new ROM games Assembler toolkit, PET Revealed external cassette £450. Tel 01-524 6916 will swap for BBC model B.

● Sharp MZ80B computer, single disk drive, CP/M disk Basic, MZ80K-B conversion tape, all manuals + some books. £1300 ono valued at £2000, only 1 yr old. Tel 051 625-8983.

● UK101 8k RAM cased 1-2MHz, new monitor, chromasonic sound baord, manuals, many games, tape recorder with counter, joy stick sockets, £115 Tel Norwich (0603) 810442.

● Sharp MZ80K 48k RAM MZ-80P3 printer, and Sharp I/O box, including all cables, books, programs and paper. Hardly used, sell the lot for £799 Tel Mike on 01-205 9450.

● 77-68 boards, professionally assembled CPU, 4kRAM, EPROM with TBug VDU, Dynamic RAM, and ROM monitor. Offers Jade S100 64k Dynamic RAM bare PCB in original packing, Offers Tel: 0788 76630.

● TI58 programmable calculator. Handy scientific, statistical and financial number crunching modul. For convenient day to day use. New battery. Complete with charger, £35. 'Sourcebook for Programmable Calculators' (£8.80). £4.40 01-229 5888.

● VIC-20 cassette, super expander, joystick, 5 cartridges, magazines, cassettes and 4 books. Cost £420, asking £270 ono. Genuine reason for sale. Tel Morris Thomson 27/1 Danube Street, Edinburgh 343 3123.

● WC20 computer with cassette, + stack expansion board with 3k RAM and VICkitII. High resolution graphics toolkit. Games cartridges, books etc. Worth ovser £300. sell £175. Tel: David Garstang 4515 eve.

● Ohio C2-8P twin 8in. Disks, 48k, Basic and op. sys. televideo TVI-920 VDU. Anadex DP-8000 printer, manuals, cables, bodes of discs. £1275 ono. Might sell separately. Northwich (0606) 74767.

● Sharp PC1211 pocket computer, cassette/printer interface + paper and ribbon. 16 months old, used little. Cost £150, selling for £75. Tel: Yateley (0252) 872253.

● TRS80 Model I Level II 32k, Exp/Int, numeric keypad, VDU, cassette recorder, lower case mod. Tandy VII printer, dust covers and user manuals £550. Tel: Biggin Hill 71740 eve. Quick sale required.

● NEWBRAIN model A complete with beginners guide under 10 hours use from new £200. No offers. Tel: Paul on Somerton (Som) 72663 eve.

● Epson HX20 microcassette drive, brand new boxed and guranteed. £65 Tel: 0206 841293.

● Nascom 2 48k, cased, graphics, Zeap, Assembler, NAS-DIS, Disassembler, Naspen, Sargon, Chess, IMP printer, Hobbit mirocassette system, software, books, magazines, spare cassettes, complete system £570. Tel: 0206 841293.

● PET 8032 + 8050 dual disk drive and printer. All mint cond. No reasonable offer refused. Tel: (01) 722 8047. Ask for Danny.

● Apple II Europlus includes Eurocolour, parallel printer and communications cards. Tandy 80 col line printer, books, manuals tape, software, (Chess etc). AP Smith (0602) 211601. After 6pm £695.

● ATOM 12k + 12k + leads — £120, Acornsoft packs 6,4,8 Adventure £5.75 each, Bug-Byte Chess, £4.50; Bug-Byte Flight simulator £4.00, Acornsoft Introductory Pack £11.50; program Power Adventure £4.50;. Tel: Bradford 569072 (eve.)

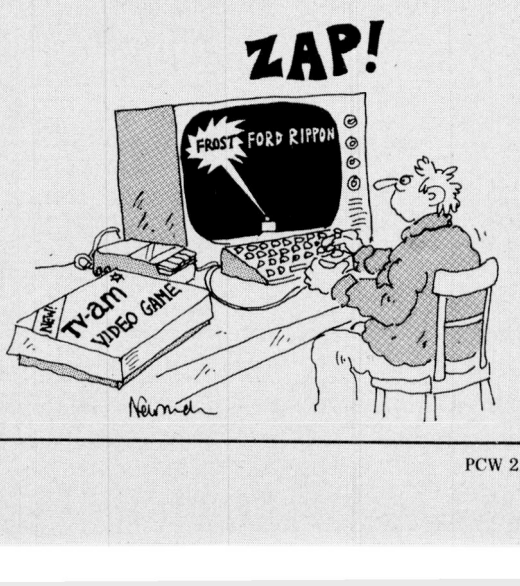
● VIC20, 16k RAM cartridge, C2N cassette unit + tapes, programmer's reference guide. VGC £200 ono. Tel: 01-546 8104 evenings, (Kingston, Surrey). Reason for sale — BBC Micro.

● Newbrain software — database, up to 10 fields, 400 records, search, sort, add, change, delete, etc. £6.95. Puckman M/C code, Arcade, Maze, 4Ghosts. Powr + £4.95. SAE for full details C Gregory, 11 Larden Road, Acton, London W3.

● PET 2001. 16k RAM. Large keyboard, new ROMs, standard + high speed digital cassette recorders. Toolkit, superchip and assembler ROMs. Presto digitizer, printer cable and books. £550 ono. bedford 61314.

● Dragon 32k, brand new, hardly used, 9 colours, sound, Hi-res graphics, + software cost £200. Sell for £160 ono. Call 01-354 2187 after 6pm.

● Nascom Nascom, Naspen £12, Hisoft Pascal 8x2716 £35, Enesrtech Pascal on tape £15, Basic toolkit 2x2708 £12, Gemini Eprom board + 16x2716 £40. All with original documents Tel: Calne (0249) 814361.



TRANSACTION FILE

● PET 2001 Old ROMS 8k Small keyboard, integral cassette. Hardly used. £200 Tel 01-643 3120.

● Genie 16k EG3003, with excellent B/W TV Printer, interface, programmer's machine, Good condition with cassette utilities, manuals, books, magazines. £210 ono. Tel Cook 01-599 1737 after 7.00 pm London/Essex.

● Video Genie E3003 32k. Lower case, sound, joysticks, 2 general northern feature ROMS, 50+ games/utilities inc Edtasm W4W Adventures Arcade. Tel Bedford (0234) 51497 after 4pm £200.

● Sharp MZ80K 48kRAM, extended Basic, Pascal compiler, Forth, Assembler, expansion box, lots of software, Delivery within 30 miles posible. £400 ono.Tel Ash Green 872150 (near Dartford Kent) eve.

● CBM 4032 12 VDU with Whitby softchips, Supersoft Papermate Wordpro, & games. Very new condition. £520+. Home purchase forces sale. Write with sae to Mr P M Lee, 200 Stanley Road, Teddington, Middx TW11 8UE.

● Software for Apple, all disc based. Applewriter 2, Visicalc, Tasc Basic compiler, DOS Toolkit, Locksmith 4.1. 34 different games — offers. Harding 30, Teignmouth Road, Dawlish, Devon.

● Sharp MZ80K Interface box, Epson MX80, Eprom programmer + extras, Software Knights Commander, Zen Assembler, Speed Basic, Forth, Disassembler, 100 games and documentation VGC. £700 Tel 01-808 2463 eves 02404 4737 w/ends.

● Sharp MZ-80K 48k 1½ yr old. little used. Speed Basic, Assembler, games, manuals. £250 for quick sale. Will delivery London area. Tel Jon Stranger 01-831 6144 (day) or 01-727 5840 (eve).

● Teletype ASR33 with stand £100. UK101/8k cased, Extras £120. Magazines complete volumes, Vol 1 onwards, offers. Waltham Cross 20202.

● Sharp MZ80K — 48k RAM Quantum Hires board, Basic, Pascal, M/C Space Invaders + other games. Offers over £400. Contact Ian Kenney, Coniston, Wynnstay Lane, Marford, Wrexham Clwyd LL12 8YA (097883 2031).

● Nascom 2 attractive rack system professionally built. 32k RAM (B) board 16k RAM 8k Basic 3A PSU toolkit ROM graphics ROM with keyboard case cassette TV tapes manuals. Tel (0977) 82138 offers.

● PET 2001 'Old ROM' 8k RAM, Integral cassette £125 ono Tel Brookwood 5832.

● Commodore 64 with C2N cassette unit. 2 months old. £320 ono. PET/CBM personal computer guide £5 Tel Sheffield 29894 (work) or 399241 after 6pm.

● TRS-80 16k LII Cassette player, VDU, manuals, joystick, numeric keypad, A few programs. Excellent condition £300 Tel Long Eaton 5838.

● Video Genie EG 3003 32k in excellent condition complete with manuals etc. Car purchase forces sale. Consider any offers. £220 ono. Tel 01-561 4918.

● Breaking Acorn ATOM BBC type ROM £25, utility ROM £8, Floating point ROM £8, memory chips, via and other chips for sale. All prices negotiatble Tel (0279) 722688.

● Superboard 8k RAM 2 MHz +2.5MHz (switchable), 300 + 600 Baud (switchable), power supply (5 amps) + cassette + micro all in one case £95 ono. Tel 01-204 0424 eve John Morris.

● 32k CBM 3032 computer. Green screen, tape deck, toolkit, much software and books, dust cover, All in excellent condition, only £395 ono. Tel 0632 745771 eve or 324449 daytime.

● Newbrain Word Procesor options include save/load to tape, paged organisation, uncrashable, directory look-up, all normal W/P functions, manual, cassette £5. Could pay 10 times! K Polston 9 Bouchier Walk, Rainham, Essex RM13 7HL.

● Wanted urgently Sharp MZ-80B. Will pay good price. Printer and disc drive also if you have them. Cash waiting. Tel Watford 46955.

● TRS-80 Model 3 + 2 internal 40 track drives + cassette deck + software on disk and tape £1400 ono. (New Nov/82) 01-572 2917.

● Tangerine Micron rack system. 48k. Tanbug V2, Space Invasion ROM and controller. Extensive software, all manuals. £650+ computer. Get true expandability for £325 ono. Hinkley, Leics. Graeme on (0455) 632679.

● CBM PET 2001 New/old ROMS, 24k, small keyboard, integral monitor/cassette, internal soundbox, 'arrow', fast load/save chip, toolkit. Programmes, games, books £250 ono. Littlehampton 7607, Sussex.

● PET 2001 8k old ROM, integral cassette, + many books, manuals and software including Chess, Invaders and Startneck £200 ono. Tel Lichfield (05432) 52653.

● Acorn Atom 12k RAM + 12k ROM New 3A power supply Basic book + Atom Magic book £97. Tel Dudley 52918 after 6pm.

● UK101 40k RAM, Cegmon monitor, sound box, 300 to 4000 baud 1,3 & 4. New ROMS 48x32 screen + games manuals etc, cased £110 ono or will split Tel Dundee (0382) 736251.

● ZX81 56k RAM pack by Audio Computers £29. Write to Leon, 26 Byron Crescent, Coppull. nr Chorley, Lancs PR7 5BD. (First come, First . . .)

● Casio Basic and Scientific Portable Computer FX702P + Microl Programming pack + user guide issues and manuals. In excellent mint conditon and original new packing £80. Tel 0325 312417 after 4pm.

● Nascom software wanted. Crystal Basic, Pascal, games, keyboard case, I/O card, RAM card, Nas-cal sound O/P card etc. John Gallagher Tel 01-204 3777 home, 01-573 3811 Ext 420 work.

● Sinclair SPECTRUM 16k. Issue one PCB + Sharp cassette recorder, + manual and Horizons Starter software cassette £100. 5 months old J/T Ireland 2 FLT INST Repair SQDN RAF Sealand CLWYD CH5 2LS.

● Acorn ATOM 14k RAM 12k ROM, connectors, printer interface, with Getting Aquainted and ATOM Magic books, Asteroids, £135 Tel: High Wycombe (0494) 28302.

● Sharp MZ80K 48k. Guaranteed until Jan 84. £300 of business and games software including S calc. Wordpro, Zen, Pascal, Alsorted Adventures, Pacman, Asteroids, Golf. Only £440 ono. Tel Ruislip 39888 (North London).

● Commodore 4032, 14 months old + cassette, toolkit, software £550. Also Epson MX80 F/T printer £225. Software includes Wordpro, Strathclyde, Chess etc. Many extras. Demos freely given. Stanton St John 285 Oxford.

● Sharp MZ80K floppy twin drive. New boxed £490 ono. Also printer, new £290 ono. Tel 01-952 4836.

● Apple II Europlus 16k. Excellent condition, includes Eurocolour board, paddles, software, 3 Apple manuals, 2 Apple machine language books, carrying case, TV modulator, cassette leads. £475 Tel Southport (0704) 76567.

● Sharp MZ-80K software X-Basic, Forth, Pascal, Fortran, Machine Code. Approximately 150 programs £70 may separate, John Chan 318 Great Western Street, Moss-Side Manchester M14 4LP. Tel weekends 061-226 4364.

● TI59 with PC-100C printer, Master Module, Applied Stats, Maths Utility. Spare cards, print paper etc. V good condition £130. Tel Southend (0702) 75977 eve.

● PET/CBM 3016 32k Basic 4.0 and CBM 3040, dual drive floppy disk. Software includes PET Tutor and lots of games. £600. Tel Mr Both 01-337 1285 day or 01-890 9245 eve.

● BBC micro software for sale. Acornsoft: Arcadians, Snapper, Monsters, Defender, Rocket-Raid. All hardly used and in excellent condition. The lot for £40 or £8 each. Tel Wrington Std (0934) 862231.

● Spectrum.48k complete with Sinclair ZX printer. Both new £210. Wanted BBC "B" model, C/W software, montior, etc W.H.Y? would accept "A" model for upgrade. Tel Mitlon Keynes 0908 313379.

● SPECTRUM 48k boxed, brand new. Unwanted gift. £160. London E6. Tel 476 7727 anytime.

● Excellent value, ideal for beginner/advanced programmer. 38k PET 2001, new ROM, Integral cassette deck. Includes 100+ programmes. Over £50 computer books. Cheap! Only £350.00 ono.Get Lucky! Tel 01-554 9548.

● Wanted Superbrain DD and dot matrix printer. Must be perfect condition. Re advertisement — previous respondents please tel again. J Carr, Tel 0203 418938 (work) or Kenilworth 55064 (home).

● ZX Spectrum 48k, with custom case and program, including Timegate, Ground Attack, Flight simulator + books and magazines. All for price of a 16k £125. Complete in ecellent condition. Tel 090484-271 (York).

● Acorn Atom 12k RAM 12k ROM. Floating Point Business Adventure packs, Galaxians Defender etc. Leads PSU manuals, books, tape recorder £200 ono. Tel 031 336 3390 eve Edinburgh area.

● TRS80 model I, 48k with upper/lower case driver fitted. Cumana disc drive. LDs 503 and Ass/Editor cassette recorder. All manuals. Excellent buy £500. A Greatwood Reading 473204 after 6.0pm.

● MZ-80k. 48k Star Trek. An exciting non graphical game with many challenges. Has all normal features + sophisticated ones. £6 M Riley 105 Rea Valley Drive, Birmingham B31 3XN 478 1563.

● MZ-80K. All memories games pack. Contains fight cycles from Tron. Worm, Avoid The Obstacles, and Get A Long Tail £6. M. Riley 105 Rea Valley Drive, Birmingham B31 3XN 478 1563.

● ACT Sirius 1 16 Bit micro. Software development machine for sale. Less than 9 months old. £2000 inc. Tel Dorothy North on Watford (0923) 31289.

● Sharp MZ80A. Perfect condition, all manuals and software in original packing. 1 yrs warranty. Dust cover, Database and books £450 Tel Bolton 45981.

● OSI superboard 8k RAm, 10A PSU modulator £89. 610 expansion board, 24k RAM, disk controller £125. OSI cased floppy disk drive with DOS, disks, manuals, software £245. Cambridge 315686.

● ZX81 Sinclair built, 16k RAM, all leads, 16 arcade games, BIPAK sound, manual + 3 books. Very good condition. Cost £150 new. Accept £70 ono. Tel Bradfield (0734) 744254.

● ZX81 +16k RAM Sinclair built. Good condition + £20 of software. All leads etc. included. All in boxes £50. Tel 01-876 4332 (London).

● MZ-80K Spaceracer. Steer your way thorugh the hyper-space channel avoiding space debris as you go. 2 versions, £3 inc. to J Thirkettle 5 Salehurst Rd., Ipswich IP3 8RT.

● FX702P with cassette interface and printer. Cost when new £190, now sell for £100 ono. Must go Tel (070 17) 24805 after 6pm Address 70 Sydney Road, Gosport, Hants.

● Radio Shack line printer III with expansion interface 10CPS 9x7 dot matrix complete with stand and manual cat no 26-1156A. Virtually new, light usage only £500 Tel Reading 0734 473042.

● TRS80 Model I, level 2, 16k. CPU, VDU, CTR 80 cassette, leads, games, Tiny Pascal, TBug manuals £285. West Forest (073 477) 5163.

● Sharp MZ-80K database. Includes search, sorting, editing and mailing list, (labels) and all output to screen and /or printer. Only £15 on cassette. E Soul 56 Elm Walk, Raynes Park, London SW20.

● Wanted written and taped software for 8k Superboard II with Cegmon 48 x 32 screen. Also printer or any hardware. Ken Humphreys 64 Lower Road, Hextable Kent BR8 7RZ Swanley 62925.

● Superpet. Commodore 8032 Inc cassette + Supersoft Assembler chip, + TRS-80 model-1 level 2 16k complete with leads. Many manuals, £750. Please view. Tel (daytime) 01-488 3131 ext 2062. Alistair Horlock.

● Apple disk card 600-0037 £45. Printer 100CPS with parallel card £175. Exchange with cash adjustment. 12in green monitor. Manby Lymington 72518.

● Data Dynamics 390 teleprinter. RS232 interface; silenced; with paper-tape reader/punch. Probably the cheapest way to get hard-copy and back-up storage. £100 (worth more) 07618 378 (Bristol area).

● Swap my Sharp MZ80B with 74k hi-res graphics + software for A BBC model B or £475 ono. Tel 092 576 3849.

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● Sharp MZ80K, 48k RAM, printer interface, extended Basic, Zen Assembler, Disassembler, Space Invaders, manuals £270 ono (0480) 74355 (eve).

● BBC model B, NEC PC8023 printer, CTR80 cassette recorder. Hardly used, original packaging. £200 worth of software and books (Acornsoft) etc, worth £1050 accept £750 ono. Tel Wimbledon London 01-946 5547 eve.

● Sharp MZ-80K 48k RAM, Complete with Basic, manual and over £60 of software, including Basic tool kit; + dust cover. Excellent condition £325. ono.Tel Wantage 3820.

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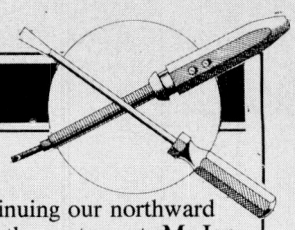
Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

ACC NEWS



Rupert Steele presents his monthly round-up of news from the Amateur Computer Club.

Communications looks set to become the front end of computer development work in the future. It is possible that, within the next 15 years, most useful single machine software will have been written, and people will have to turn their attention to communications. Prestel has been the first attempt to bring data communications to the nation as a whole, and (in the language of the Civil Service) it has not been an unqualified success. Its major achievement so far has been to pinpoint many of the problems of such an undertaking.

Prestel has in the past suffered from being too small and too expensive; and possibly being launched too soon. The small size of the database has meant that an information provider would only gain marginally from being online. If having Prestel and being an IP were very cheap, then the marginal benefits would have been enough to see the system take off. But because an IP account is expensive, and there is a connection charge in addition to the phone bill (and, until recently, adaptors were hideously expensive), the system has never taken off and most of the computers are in mothballs.

It is only now, through involving the home micro owner, with cheap adaptors and tangible benefits such as micro software ('telesoftware' in Micronet 800) and home banking ('homelink'), that the numbers of subscribers may build up. Moral: if you're setting up a completely novel system, you must expect to lose a lot of money if you want it to take off. Setting unattainable economic targets will strangle it at birth.

Technology is now entering a new phase in communications. We are setting new methods for handling large bandwidths, through innovations such as fibre optics and large scale exploitation of existing ideas (which reduces prices) such as cable TV. I'd like to start some kind of discussion, through this page, of the ideas the amateur movement have about all this. Should there be a programme to install BT-operated fibre optic or co-ax links to the nation's houses, and, if so, what would be done at which frequencies? Should channels be made available for high bandwidth modem communications, and would we like to see a high speed high res 'Prestel'-like service? Can the cable TV system (if it ever gets 'off the ground') be used with micros? Now is the ideal time for everybody out there to give their high bandwidth wish list an airing and, you never know, a man from the ministry might actually read *PCW* and take note.

News

I hope you're receiving Club Spot 800, on Prestel page *8008#, loud and clear. By the time this comes out, Club Spot will have been in operation for three months or so. You aren't editing on Club Spot yet? Then, contact me. We are thinking of holding a further Editors' Conference in the autumn, so the more people who write asking about editing in club spot, the more likely the conference is to come off.

A couple of exhibitions are on in June. On Sunday 12 June, there is the South of England Personal Computer Fair to be held at the Wood Green School, Witney, Oxfordshire OX8 6DX. The ACC and OPeCC will be there, showing the amateur flag. Enquiries about the show to Mr P J Wilde on 0993 2355 during school hours.

This year's IPC Computer Fair is at Earl's Court from 16—19 June. The ACC will be there, as will lots of other clubs. If you didn't get a stand for your Club via David Annal, then too bad. But you might like to contact him for a stand for the PCW show this autumn. His address is: 142 Windermere Road, London SW16 5HE. The ACC wouldn't mind a bit of help on the stands. If you're interested, contact Peter Whittle, 49 Bartlemas Road, Oxford OX4 1XU or give me a call. The ACC has lots of nice A3 posters to give away for you to display in your Club meeting place, shop or library. Let me know if you want one (or more); they are free, gratis and for nothing. Peter Whittle (address above) has some ACC T-shirts for sale: write for details or pick up one at a show.

Club things

At the beginning of this year, a new club was formed in Gravesend. The Secretary is Steve Janday and the Club's address is: Gravesend Computer Club, c/o The Extra Tuition Centre, 39 The Terrace, Gravesend, Kent DA12 2BA. Their membership is about 50p, with a wide range of machines owned.

North a bit, we come to Mr M Osborne of 8 Elvington, Kings Lynn, Norfolk, who would like to start a Spectrum User Group in his area. So why not drop him a line if you are of like mind?

Continuing our northward trek on the east coast, Mr Ian Waugh of 13 Briardene Drive, Wardley, Tyne Wear NE10 8AN writes of his group of BBC computer owners, who are thinking of becoming a formal club. So if you're in Wardley and have a BBC m/c, then you know who to contact.

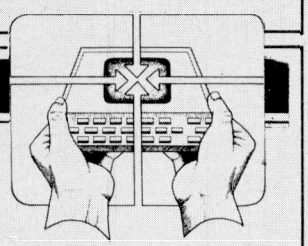
Still north and east, we have the Grimsby Computer Club (contact Kevin Turner on Grimsby 824063 — evenings). With a membership of over 85, they meet at St James Choir School in Grimsby. They have lots of ideas, such as cheap equipment hire (including Teach-yourself BASIC tapes) and a business appreciation course. Interested? Then give Kevin a call.

Down in the deep south, a Mr P Cherriman writes of the Arun Microcomputer Club, which meets at the Wick Amenity Centre, Wick Farm Road, Littlehampton, West Sussex BN17 7BL. Ring Littlehampton 7607 for more details.

And finally, I cannot resist a mention for the Mold Computer Club, who recently wrote saying 'the Mold Club is a non-constitutional organisation...we have more applicants for membership than we can manage [and] we would request you to remove our name from your correspondence file, and not advertise us in any way. So if you live in Mold, you can't join your local club. How Moldy.

* For futher information about the ACC, or anything mentioned in this article, contact: Rupert Steele, St John's College, Oxford OX1 3JP or telephone (0865) 512811.

CTUK! CONTACTS



*For further information on ComputerTown UK! see 'CTUK News' or Prestel page *800803 #*

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NETWORK NEWS

These are all the European networks of which we're aware. Most are free — but phone them for details.

Forum-80 Hull ... (Forum-80 HQ) Tel: 0482 859169, System operator: Frederick Brown. International electronic mail, library for up/down loading software. Forum-80 Users Group, Pet Users section shopping list system hours, 7 days a week midnight to 8.00am, Tues/Thurs 7.00pm to 10.00pm Sat/Sun 1.00pm tp 10.00pm.

Forum-80 London ... Tel: 01-747 3191. System operator: Leon Jay. Electric Mail, library for downloading. System hours: Tues/Fri/Sun 7.00pm to 11.00pm.

Forum-80 Holland ... Operator: Nico Karssemeyer, Tel: 01 313 512 533. Facilities: electronic mail, program up/downloading, shopping list. Hours; Tues-Sat 1800-0700 nightly, continuous from 1800 Sat-0700 Tues.

CBBS London ... Operator: Peter Goldman, Tel: 01-399 2136. Facilities: electronic mail, program downloading. Hours: Wed 0700-0930 & 1900-2200, Fri 1900-2200, Sun 1600-2200.

Forum-80 Milton ... (TRS-80 Users Group 80-Nett) Tel: 0908 566660. System operators: Leon Heller and Brian Pain. Electronic mail, library, newsletter, TRS-80 information system hours: 7 days a week 7.00pm to 10.00pm.

Mailbox-80 Liverpool ... 051-220 9733. System operator: Peter Toothill, Electronic mail, down-loading TRS-80 information.

ACC ... members bulletin board, Peter Whittle (0908 44262).

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 010-468 7300 706.

Tree Tradet ... Sweden 010-468 190522.

Rewtel ... (Radio & Electronics World's bulletin board) 24 hour service 7 days a week. Packed with useful and interesting information, etc. Subscription fee £10 pa. Non-subscribers may have 8 mins free. Hardware required: 300 baud full duplex. Standard page: 64 characters by 16 inches. Tel: (0277) 232628.

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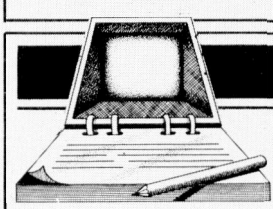
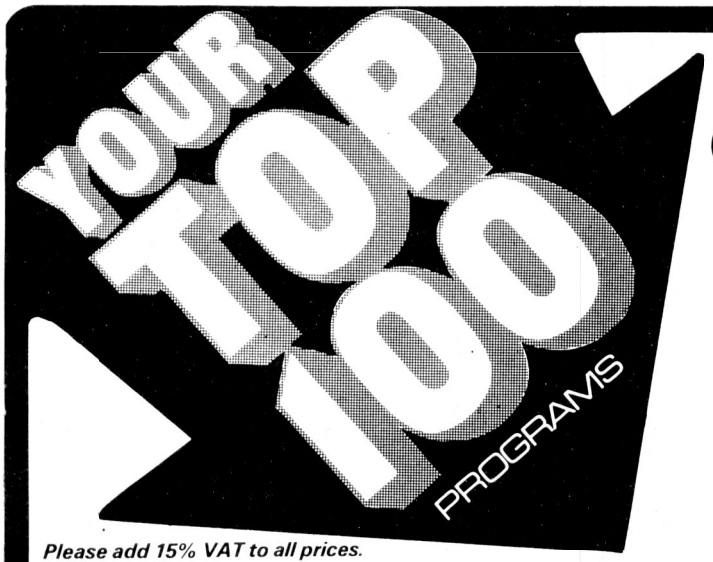


Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printer's errors, etc.

London	(Barbican) Business Telecom Exbn. Contact: Online Ltd, 09274 28211	24-26 May
London	(Barbican) Int Conf & Exbn on Comps & Comms in the City. Contact:as above	24-27 May
London	(Wembley Conf Centre) Int W/processing Exbn & Conf. Contact: 01-405 6233	24-27 May
Melbourne	(CETIA) Comps, Comms & Electronic Tech Exbn. Contact: CETIA, PO Box 259, Roseville,Sydney 2069.	31 May-3 June
Slough	(Fulcrum Centre) Nat Apple Exbn & Convention. Contact: Val Seddon, 0614 560189 (night)	3-5 June
London	(Cunard Int Hotel) Int Commodore Comp Show. Contact: Crouchmead Comms Ltd, 01-778 1102	10-11 June
Brazil	Data Processing & Equip for Offices. Contact: D Empreendimentos, SA Rua Francisco, Rocha 551, Curtiba, Parana.	10-19 June
London	(Holiday Inn) Computer Day Exbn. Contact: Crouchmead Comms Ltd, 01-778 1102	16-19 June
London	(Earls Court) Computer Fair. Contact: Reed Exbns, 01-643 8040.	16-19 June
Manchester	(Belle Vue) Compec North. Contact: IPC Exbns Ltd. 01-643 8040.	21-23 June



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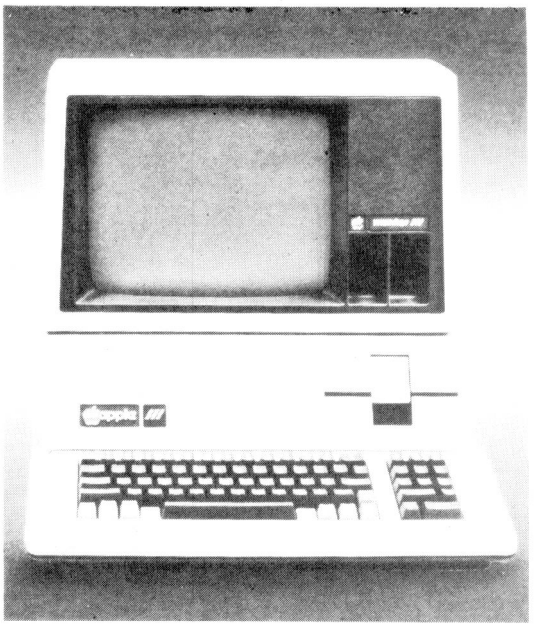

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PROGRAMS

Unstoppable as I seem to be on a 'meteoric rise to obscurity' (to quote one comment of wry congratulation from a referee), the time has come to hand over to a new programs editor – Surya.

Surya has stepped in, perhaps a little at the deep end, from a background in freelance writing, educational software programming and work with children. From now on he will be the person to contact about anything concerning programs.

I'm sure all of PCW*'s readers will join me in extending Surya a warm welcome, and in wishing him all the best with us on* PCW.

It only remains for me, in the capacity of erstwhile programs editor, to say 'thankyou' to all the referees, authors and readers who've put fingers to keyboards and cassette recorders over the past 18 months.

Programs will continue in the same vein for the foreseeable future. But naturally Surya's great organisational talents will ensure a faster turnover of software and related correspondence. As a part of my own 'obituary', I have only to apologise for all the letters that went unanswered – correspondence to PCW *does tend to be one-way – and to express the hope that Surya will not be short of programs to include in* PCW.
Maggie Burton

Ok. Boring stuff first. When submitting programs to *PCW*, please include the following:-
(a) A cassette or disk of the program.
(b) A listing on plain, white paper (typewritten if no printer available).
(c) Documentation – this should be comprehensive, but please try to be brief.
(d) A suitable *sae* if you would like your material to be returned after use.

Please mark (a), (b) and (c) with your name and address, program title, machine and minimum RAM required and – if possible – a daytime phone number. All programs must, *please*, be fully debugged. Send contributions to: Surya, *PCW* Programs, 62 Oxford Street, London W1A 2HG.

I'll do my best to acknowledge programs within a few days of receipt, but please give me a fortnight or so before querying delivery. Following this acknowledgement, it may take quite some time before a decision can be made, so please be patient. Generally speaking, programs which are rejected for any reason are returned fairly quickly so 'no news...'

Finally, readers sometimes remark on the lack of programs for certain machines (witness the reader who sent in an Atari program with the comment 'you may have heard of this machine'). All I can say is, you send them in and we'll publish them. Note: All programs we publish are paid for at a regular rate.

Anyway, enough of all that and onto this month's offerings...

BBC Balloon

by A Roe

Ok, so it's another maze game. With this game, however, the object you have to manoeuvre through the maze is not a pac-man or gobble monster, but a hot-air balloon (what else?). Your balloon will be punctured if it strikes a wall of the maze, so a fair amount of skill is required. The erratic motion of the balloon (to simulate the effect of the wind) adds to the difficulty.

You are given three balloons, with a bonus balloon being awarded for every 10,000 points scored. There is no time limit.

One criticism is that the program only offers a single maze, so it is possible to learn the route thus detracting from the challenge of the game. Overall, though, the game is well-written and makes impressive use of the BBC's excellent graphics.

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PROGRAMS

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>L.
  100DATAR,5,R,21,S,33,E,53
  110DATA27,33,10,53,10,53,4,61,4,69,10,53,10,81,2,81,2,81,2,81,2,81,2,81,5,73,5,69,15,69,5,73,5
,81,5,69,5,73,6,61,2,61,2,61,2,61,2,61,2,61,5,53,5,53,18
  120DATA1,8,32,88,2,17,16,4,3,88,2,19,13,6,2,88,2,22,7,10,1,88,2,24,1,14,1,88,1,39,1,88,1,39,1,
88,1,39,1,88,2,0,8,31,1,88,3,0,7,22,1,9,1,88,4,0,3,8,4,7,8,9,1,88,4,0,2,8,6,6,9,8,1,88,4,0,1,8,8
,6,9,7,1,88,4,0,2,6,10,6,10,5,1,88
  130DATA4,0,2,5,12,8,6,6,1,88,3,0,1,5,14,19,1,88,2,0,1,38,1,88,2,0,1,38,1,88,2,0,1,38,1,88,2,0,
1,38,1,88,3,0,1,22,2,14,1,88,3,0,1,19,9,7,4,88,2,0,1,5,35,88,2,0,2,6,33,88
  140DATA2,0,2,20,10,00,2,0,2,38,88,2,0,2,38,88,2,0,2,38,88,2,0,2,38,88,2,0,5,35,88,2,0,20,20,88
,1,0,40
  150DATA14,53,20,73,6,73,4,81,6,101,10,85,4,89,10,89,10,89,10,89,10,93,6,81,13,73,6,81,10
  160REM*****************************
  170REM****BALLOON*****************
  180REM****BY A.ROE AUGUST '82******
  190REM****ASSISTED BY K.ROBERTS****
  200REM****DESIGN CONSULTANT********
  210REM****AND M.STEVINSON**********
  220REM****BALLOON ADDICT***********
  230REM*****************************
  240ON ERROR GOTO670
  250MODE2
  260VDU23;8202;0;0;0;
  270PROCstrings
  280PROCtitle
  290MODE1
  300VDU5
  310PROCinit
  320PROCchars
  330PROCcourse
  340PROClife
  350REPEAT
  360PROCmove:PROCscore
  370UNTIL LIFE%=4ORGOALF%=1
  380IFLIFE%<4 RESTORE120:GOALF%=0:GCOL0,3:CLS:PROCinit:GOTO330
  390PRINTTAB(15,18)"GAME OVER":TIME=0:REPEAT UNTIL TIME>=300
  400MODE2
  410COLOUR3
  420PRINTTAB(0,3)"YOU SCORED ":SCORE%
  430PRINTTAB(0,6)"ANOTHER GAME ?"
  440*FX15,0
  450RESTORE110:PROCmusic:PROCdelay
  460IFGET$="Y" RESTORE120:MODE1:VDU5:PROCinit:SCORE%=0:LEVEL%=1:DIFF%=45:LIFE%=1:GOALF%=0:FREEF
%=1:GOTO330
  470PROCdelay
  480*FX11,50
  490*FX12,7
  500*FX15,0
  510VDU4:MODE1:END
  520DEFPROCmove
  530GCOL0,0
  540PN%=1
  550IFINKEY(-200)ANDINKEY(-153) SOUND1,-10,200,1:PROCballoon:XPOS%=XPOS%-32:YPOS%=YPOS%+32:GOTO
640
  560IFINKEY(-200)ANDINKEY(-201) SOUND1,-10,200,1:PROCballoon:XPOS%=XPOS%-32:YPOS%=YPOS%-32:GOTO
640
  570IFINKEY(-185)ANDINKEY(-201) SOUND1,-10,200,1:PROCballoon:XPOS%=XPOS%+32:YPOS%=YPOS%-32:GOTO
640
  580IFINKEY(-185)ANDINKEY(-153) SOUND1,-10,200,1:PROCballoon:XPOS%=XPOS%+32:YPOS%=YPOS%+32:GOTO
640
  590IFINKEY(-185)ANDXPOS%>=960ANDYPOS%<=224 GOTO640
  600IFINKEY(-153) SOUND1,-10,200,1:PROCballoon:YPOS%=YPOS%+32:GOTO640
  610IFINKEY(-201) SOUND1,-10,200,1:PROCballoon:YPOS%=YPOS%-32:GOTO640
  620IFINKEY(-185) SOUND1,-10,200,1:PROCballoon:XPOS%=XPOS%+32:GOTO640
  630IFINKEY(-200) SOUND1,-10,200,1:PROCballoon:XPOS%=XPOS%-32
  640GCOL0,2
  650PROCballoon:PN%=0:IFTIME>=DIFF% GCOL0,0:PROCballoon:GCOL0,2:SW%=SW%+1:NSWINGS%=NSWINGS%+1:T
IME=0:IFSW%=5 SW%=1
  660ENDPROC
  670MODE1:REPORT:PRINT " IN LINE ";ERL
  680VDU4
  690*FX11,50
  700*FX12,7
  710*FX15,0
  720END
  730DEFPROCchars
  740VDU23,225,7,24,32,64,64,128,128,128
  750VDU23,226,224,24,4,2,2,1,1,1
  760VDU23,227,128,128,128,64,64,32,24,7
  770VDU23,228,1,1,1,2,2,4,24,224
  780VDU23,229,7,7,7,7,0,0,0,0
  790VDU23,230,224,224,224,224,0,0,0,0
  800VDU23,231,1,1,1,1,1,1,1,1
  810VDU23,232,0,0,0,0,0,0,0,0
  820VDU23,240,128,64,32,16,8,4,2,1
  830VDU23,241,1,2,4,8,16,32,64,128
  840VDU23,242,255,255,255,255,255,255,255,255
  850VDU23,245,12,62,126,127,252,248,224,64
  860VDU23,246,2,4,8,16,32,112,112,0
  870ENDPROC
  880DEFPROCballoon
  890IFPN%=0 GOTO940
  900IF(SW%=1ORSW%=3)AND(POINT(XPOS%+16,YPOS%-16)=3ORPOINT(XPOS%+48,YPOS%-16)=3ORPOINT(XPOS%+16,
YPOS%-48)=3ORPOINT(XPOS%+48,YPOS%-48)=3) PROCburst:ENDPROC
  910IFSW%=2AND(POINT(XPOS%+112,YPOS%-16)=3ORPOINT(XPOS%+80,YPOS%-16)=3ORPOINT(XPOS%+80,YPOS%-48
)=3ORPOINT(XPOS%+80,YPOS%-16)=3ORPOINT(XPOS%+80,YPOS%-80)=3ORPOINT(XPOS%+56,YPOS%-116)=3) PROCbu
rst:ENDPROC
  920IFSW%=4AND(POINT(XPOS%-56,YPOS%-16)=3ORPOINT(XPOS%-16,YPOS%-16)=3ORPOINT(XPOS%-56,YPOS%-48)
=3ORPOINT(XPOS%-16,YPOS%-80)=3ORPOINT(XPOS%+16,YPOS%-116)=3) PROCburst:ENDPROC
  930IFPOINT(XPOS%+48,YPOS%-148)=3ORPOINT(XPOS%+16,YPOS%-148)=3 PROCburst:ENDPROC
  940MOVEXPOS%,YPOS%:PRINTBALLOON$(SW%)
  950ENDPROC
  960DEFPROCcourse
  970FORI%=01031
  980READ BLOCKS%:IFBLOCKS%=88 GOTO980
  990X%=0
  1000FORJ%=1TOBLOCKS%
  1010READSPACES%:IFSPACES%=0  GOTO1030
  1020PRINTTAB(X%,I%)SPC(SPACES%);:X%=X%+SPACES%
  1030READCROSS%:IFCROSS%=0 GOTO1050
  1040PRINTTAB(X%,I%)STRING$(CROSS%,"*");:X%=X%+CROSS%
  1050NEXT:NEXT
  1060IFLIFE%<3 GCOL0,1:FORI%=1TO4-LIFE%:PRINTTAB(34+I%,26);MINI$;:NEXT
  1070ENDPROC
  1080DEFPROClife
  1090GCOL0,1:MOVE16,1000:DRAW16,1000:DRAW232,1000:MOVE232,768:DRAW16,768:DRAW16,1000
  1100MOVE1000,32:DRAW1000,32:DRAW1264,32:DRAW1264,224:DRAW1000,224
  1110GCOL0,2:PRINTTAB(1,2)"BONUS":GCOL0,0:PRINTTAB(1,4)STRING$(4,CHR$242):GCOL0,2:PRINTTAB(1,4);
BONUS%
  1120GCOL0,1:PRINTTAB(34,29)"START"
  1130GCOL0,0:PRINTTAB(34+LIFE%,26):MINI$:GCOL0,2
  1140ENDPROC
  1150DEFPROCstrings
  1160DIMBALLOON$(4)
  1170BALLOON$(1)=CHR$225+CHR$226+CHR$8+CHR$8+CHR$10+CHR$227+CHR$228+CHR$8+CHR$8+CHR$10+CHR$231+C
HR$8+CHR$10+CHR$231+CHR$8+CHR$10+CHR$229+CHR$230
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PROGRAMS

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1180BALLOON$(2)=CHR$9+CHR$9+CHR$225+CHR$226+CHR$8+CHR$8+CHR$10+CHR$227+CHR$228+CHR$8+CHR$8+CHR$
10+CHR$241+CHR$8+CHR$8+CHR$10+CHR$241+CHR$8+CHR$8+CHR$10+CHR$229+CHR$230
1190BALLOON$(3)=CHR$225+CHR$226+CHR$8+CHR$8+CHR$10+CHR$227+CHR$228+CHR$8+CHR$8+CHR$10+CHR$231+C
HR$8+CHR$10+CHR$231+CHR$8+CHR$10+CHR$229+CHR$230
1200BALLOON$(4)=CHR$8+CHR$8+CHR$225+CHR$226+CHR$8+CHR$8+CHR$10+CHR$227+CHR$228+CHR$8+CHR$10+CHR
$240+CHR$10+CHR$240+CHR$8+CHR$10+CHR$229+CHR$230
1210MINI$=CHR$245+CHR$8+CHR$8+CHR$10+CHR$246
1220ENVELOPE3,1,0,0,0,0,0,0,127,-1,-1,-1,-1,120,60
1230ENVELOPE1,1,4,-10,4,5,20,5,127,0,0,-5,126,126
1240ENVELOPE2,7,10,-10,50,5,20,5,127,0,0,-1,126,126
1250ENDPROC
1260DEFPROCinit
1270XPOS%=960:YPOS%=192:SW%=1:TIME=0:PN%=0:NSWINGS%=0:HIGHT%=192:A=30:BONUS%=1000
1280*FX15,0
1290*FX11,1
1300*FX12,1
1310ENDPROC
1320DEFPROCburst
1330SOUND0,-15,4,2:VDU19,0,7,0,0,0:VDU19,3,0,0,0,0:PROCdelay:VDU20
1340LIFE%=LIFE%+1
1350GCOL0,0:PRINTTAB(35,26);MINI$:GCOL0,2
1360PROCinit:IFLIFE%=4 ENDPROC ELSE PROClife
1370ENDPROC
1380DEFPROCdelay
1390TIME=0:REPEAT UNTIL TIME>=40
1400ENDPROC
1410DEFPROCtitle
1420FORI=1TO4:READRRSE$,PIT%:COLOURI:PRINTTAB(I,1);RRSE$:SOUND1,2,PIT%,2:PROCdelay:NEXT:COLOUR3
:PRINTTAB(6,1)"PRESENT..."
1430VDU19,1,0,0,0,0:VDU19,5,0,0,0,0:VDU19,7,0,0,0,0:VDU19,11,0,0,0,0:VDU19,9,0,0,0,0:VDU19,139,
0,0,0,0
1440GCOL0,11:COLOUR9:COLOUR139
1450PROCcircle(610,640,300)
1460PRINTTAB(6,10)"BALLOON":PRINTTAB(8,12)"FUN"
1470GCOL0,6:MOVE800,406:DRAW640,128:MOVE416,406:DRAW560,128
1480GCOL0,5:PROCcircle(600,186,20):GCOL0,7:PROCcircle(600,140,25)
1490GCOL0,6:MOVE560,32:MOVE560,128:PLOT85,640,32
1500MOVE560,128:PLOT85,640,128
1510VDU20
1520PROCmusic
1530PRINTTAB(2,25)"HIT"TAB(1,26)"SPACE"TAB(14,25)"FOR"TAB(13,26)"MORE!"
1540PROCgetspace
1550COLOUR128:PRINTTAB(1,1)SPC16:COLOUR139:PRINTTAB(6,10)SPC7TAB(8,12)SPC3
1560VDU19,139,4,0,0,0
1570FORI=7TO4STEP-3:COLOURI:PRINTTAB(7,5)"GUIDE"TAB(6,8)"BALLOON"TAB(6,11)"THROUGH"TAB(7,14)"MA
ZES"TAB(7,17)"USING:":IFI=7 PROCgetspace
1580NEXT
1590FORI=7TO4STEP-3:COLOURI:PRINTTAB(9,7)"N"TAB(9,9)"  "TAB(5,11)"W @   [ E"TAB(9,13)":"TAB(9,15
)"S":IFI=7 PROCgetspace
1600NEXT
1610FORI=7TO4STEP-3:COLOURI:PRINTTAB(7,5)"BONUS"TAB(6,8)"BALLOON"TAB(8,11)"FOR"TAB(7,14)"10,000
"TAB(7,17)"POINTS":IFI=7 PROCgetspace
1620NEXT
1630COLOUR12:PRINTTAB(7,11)"GOOD"TAB(6,13)"FLYING.."
1640PROCgetspace:CLG:VDU20:DIFF%=45:LEVEL%=1:SCORE%=0:FREEF%=1:GOALF%=0:LIFE%=1:ENDPROC
1650REM**********************:
1660DEFPROCcircle(X%,Y%,R%)
1670LOCALA%
1680FORA%=0TO360STEP20
1690MOVEX%,Y%
1700MOVESIN(RAD(A%))*R%+X%,COS(RAD(A%))*R%+Y%
1710PLOT85,SIN(RAD(A%+20))*R%+X%,COS(RAD(A%+20))*R%+Y%
1720NEXT
1730ENDPROC
1740DEFPROCscore
1750IFYPOS%>HIGHT% HIGHT%=YPOS%:SCORE%=SCORE%+(50*LEVEL%):IFFREEF%=1ANDSCORE%>=10000 LIFE%=LIFE
%-1:SOUND0,1,0,75:PRINTTAB(34+LIFE%,26);MINI$:FREEF%=0
1760IFNSWINGS%>A GCOL0,0:PRINTTAB(1,4);BONUS%:GCOL0,2:BONUS%=BONUS%-20:PRINTTAB(1,4);BONUS%:A=1
0:NSWINGS%=0
1770IFYPOS%>900ANDXPOS%<232 PROCgoal
1780ENDPROC
1790DEFPROCgoal
1800GCOL0,0:MOVEXPOS%,YPOS%:PRINTBALLOON$(SW%):GCOL0,2:PRINTTAB(2,2):BALLOON$(1)
1810VDU19,2,13,0,0,0:VDU19,3,10,0,0,0:VDU19,0,4,0,0,0
1820PROCmusic
1830LEVEL%=LEVEL%+1
1840SCORE%=SCORE%+BONUS%
1850GOALF%=1
1860DIFF%=DIFF%-10
1870TIME=0:REPEAT UNTIL TIME>=200
1880VDU20
1890ENDPROC
1900DEFPROCgetspace
1910REPEAT UNTIL GET$=" "
1920SOUND1,2,20,2
1930ENDPROC
1940DEFPROCmusic
1950READNUM%
1960FORJ=1TONUM%:READPIT%,DUR%:FORT=1TO3:SOUNDT,3,PIT%,DUR%:NEXTT,J
1970ENDPROC
```

★★ Program of the month ★★

Apple VAT

by Alex Lake

This is an excellent VAT records program written for the 48k Apple II with at least one disk drive. The program allows you to enter your purchases and sales in the form in which they would normally be recorded by a small business/self-employed person. It calculates your input and output tax from the invoice totals, stores the records on disk and prints your VAT summaries for each of your quarterly tax periods.

All items are automatically sorted by date, and may be deleted and re-entered in case of error. The program does *not* automatically update its files, so it is important to remember to use the UPDATE

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DISK FILES option whenever new data has been entered.

The rate of VAT is set in line 190, and the first month of your financial year is set in line 260. The default tax year is 1983, and this can be updated later by resetting the value of Y$ in line 510.

The error-trapping routines are comprehensive, and the program as a whole is very professionally presented and easy to use.

The printer used for the listing given below doesn't distinguish particularly well between O(string) and 0(numeric): the variable in lines 410 and 1480 is O0$ (letter O, number 0). The variables CO, CO$, CO(), CO$(), MO$, NO, NO() and PO$ are all letters.

```
10  REM  ************************
20  REM  *                      *
30  REM  *       VAT ][         *
40  REM  *                      *
50  REM  * (C)  ALEX LAKE 1982 *
60  REM  *                      *
70  REM  * NEEDS APPLE II+ 48K *
80  REM  * WITH ONE DISK DRIVE *
90  REM  *                      *
100  REM ************************
110  REM LENGTH:12805 BYTES

120  DIM REC$(12,50),OP$(12,25)
130  DIM TEMP$(1,50),OM(12),TT(13),ST(13)
140  DIM MN$(12),PR$(12),REC(12),NO(12)
150  DEF  FN M(X) = X - (X > 12) * 12 + (X < 1) * 12
160  DEF  FN V(X) =  VAL ( MID$ (REC$,56,6))
170  DEF  FN C(X) =  VAL ( MID$ (REC$,24 + 8 * X,8))
180  DEF  FN F(X) =  INT ((X + .005) * 100) / 100
190 RV = 15: REM  * RATE OF VAT
200 VR = RV / 100
210 SN = (100 + RV) / RV
220 RV$ =  RIGHT$ (" " +  STR$ (RV) + "%",3)
230  FOR M = 1 TO 12: READ MN$(M):PR$(M) = "ABSENT": NEXT
240 MN$(0) = "   "
250  DATA  JAN,FEB,MAR,APR,MAY,JUN,JUL,AUG,SEP,OCT,NOV,DEC
260 QS = 3: REM  * NUMBER OF 1ST MONTH IN YOUR FINANCIAL YEAR
270  FOR I = 0 TO 3:QT$(I + 1) = MN$( FN M(I * 3 + QS)) + "/" + MN$( FN M(
     I * 3 + QS + 1)) + "/" + MN$( FN M(I * 3 + QS + 2)): NEXT
280  FOR I = 1 TO 7: READ ME$(I): NEXT
290  DATA ENTER INPUTS,EXAMINE/EDIT INPUTS,ENTER OUTPUTS,EXAMINE/EDIT OUTP
     UTS,UPDATE DISK FILES,PRINT INPUTS & OUTPUTS
300  DATA INITIALISE YEAR'S RECORDS
310 D$ =  CHR$ (4)
320 CO(1) = 12:CO(2) = 19:CO(3) = 27
330 SP$ = "                                                  "
340 S3$ = "   ":S$ = " "
350 S9$ = "         "
360 YV$ = " VAT ":NV$ = "NO VAT"
370 CE =  - 868:CS =  - 958
380 LC(1) = 6:LC(2) = 7:LC(3) = 7
390 H1$ = "TO DELETE LAST ENTRY,ENTER *DEL AS IF ITWERE AN ITEM."
400 H2$ = "TO ENTER AN ITEM EXEMPT FROM VAT,ADD THESUFFIX N TO IT'S COST E
     G.4.99N (RETURN)"
410 BELL$ =  CHR$ (7):PO$ = "O":O0$ = "0"
420 Z1$ = "0":Z2$ = ".00"
430 ER$(1) = " YOU CAN'T DELETE THAT ONE ! "
440 ER$(2) = " ONLY TYPE UP TO THE ] MARK "
450 ER$(3) = "ENTER A NUMBER BETWEEN 1 & 9 PLEASE !"
460 ER$(4) = "THERE ISN'T ANYTHING HERE TO EDIT !"
470 MS$ = "   (RETURN FOR NO CHANGE)"
480 L$ =  CHR$ (95) +  CHR$ (95):DT$ = "..": FOR I = 1 TO 37:LI$ = LI$ + L
     $:DL$ = DL$ + DT$: NEXT
490  FOR I = 1 TO 4: READ R$:TT$(I) = S3$ +  LEFT$ (R$ + SP$,16): NEXT
500  DATA   ALL IN,VATABLE,VAT CONTENT,ALL IN LESS VAT
510 Y$ = "1983": REM  DEFAULT FINANCIAL YEAR
520  GOSUB 1160: HOME : PRINT "ENTER YEAR (RETURN FOR NO CHANGE) ";Y$;: HTAB
     35: INPUT "";R$: IF R$ <  > "" THEN Y$ = R$
530  VTAB 1: HTAB 35: PRINT Y$
540  GOSUB 1160
550 T1$ = "ITEM       MATERL EXTERNL CAPITAL  DATE            & TOOL SERVI
     CS EQUIPMT  DD MM"
560 T2$ = "ITEM       MATERL EXTERNL CAPITAL V.A.T.           & TOOL SERVI
     CS EQUIPMT @  " + RV$
```


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PROGRAMS

```
570 T3$ = "CLIENT     INVOICE  V.A.T. INVOICE DATE
    " + RV$ + "  TOTAL  DD MM"
580 T4$ = "DATE  CLIENT     NET FEE  V.A.T. INVOICE
    @  " + RV$ + "   TOTAL"
590 T5$ =  LEFT$ ("DATE     CLIENT" + SP$,31)
600 B1$ = "  ENTER *HELP FOR HELP OR *END FOR MENU"
610 B2$ = "TYPE:< FOR LAST MONTH   > FOR NEXT MONTH     ESC FOR MENU
     E FOR EDIT        CTL-S FOR FREEZE   N FOR INDEXING "
900  PRINT : PRINT "IS THIS THE FIRST SESSION OF " + Y$ + " ?";: GET R$
910  IF R$ = "Y" THEN  GOSUB 9000: GOTO 1000
920  PRINT : PRINT : PRINT "DO YOU WANT THE DISK RECORDS ? YES";: HTAB 32:
     GET R$: IF R$ <  > "N" THEN  GOSUB 8000
1000  REM
                MENU

1010  GOSUB 1160: HOME
1020  INVERSE
1030  PRINT "****************************************
                    **          V.A.T. ]"; CHR$ (91);"
      **                                  *";
1040  PRINT "****************************************": NORMAL
1050  PRINT
1060  FOR M = 1 TO 7: HTAB 4: PRINT  LEFT$ (ME$(M) + DL$,30);: INVERSE :: PRINT

     M: NORMAL : PRINT : NEXT M
1070  PRINT
1080  PRINT "CHOOSE ONE OF THE ABOVE OPTIONS.....";
1090  GET R$
1100  IF R$ > "7" OR R$ < "1" THEN 1090
1110 MO$ = R$
1120  ON  VAL (R$) GOSUB 2000,3000,4000,5000,6000,7000,9000
1130  GOTO 1000
1140  REM  MISCELLANEOUS SUBS
1150  VTAB VP: HTAB 1: CALL CE: INVERSE : PRINT ER$(ER);: NORMAL : HTAB 1:
      GOSUB 1270: RETURN
1160  POKE 33,40: POKE 34,0: POKE 35,24: RETURN
1170  HTAB 1: VTAB 1: CALL CE: RETURN
1180 B$ =  STR$ (B): GOSUB 1190:B$ =  RIGHT$ (SP$ + B$,DIG): RETURN
1190 B$ =  STR$ ( FN F( VAL (B$))): IF  VAL (B$) < 1 THEN B$ = Z1$ + B$
1200  IF  LEN (B$) < 3 THEN 1220
1210  IF  MID$ (B$, LEN (B$) - 2,1) = "." THEN  RETURN
1220  IF  VAL (B$) <  > INT ( VAL (B$)) THEN 1240
1230 B$ = B$ + Z2$: RETURN
1240  IF  LEN (B$) -  LEN ( STR$ ( INT ( VAL (B$)))) = 2 THEN B$ = B$ + Z1
     $
1250  RETURN
1260  FOR I = 0 TO 13:ST(I) = 0: NEXT : RETURN
1270  FOR I = 1 TO 4000: NEXT : RETURN
1280  VTAB 1: HTAB 40: GET R$:R =  ASC (R$)
1290  IF R = 44 OR R = 60 THEN M =  FN M(M - 1)
1300  IF R = 46 OR R = 62 THEN M =  FN M(M + 1)
1310  IF R = 78 THEN NU = 1 - NU
1320  IF R = 27 THEN  POP
1330  RETURN
1340  REM    TWEAK REC$(M,IT)
1350 REC$ = REC$(M,IT)
1360 TREC$ = MN$(M - M * (IT > 1)) + S3$ +  MID$ (REC$,9,2) + S$ +  MID$ (
     REC$,11,21) + S$ + S$ +  MID$ (REC$,32,7)
1370 TREC$ = TREC$ + S$ +  MID$ (REC$,39,8) + S$ +  MID$ (REC$,47,8) + "
      " +  MID$ (REC$,55,7)
1380  RETURN
1390  REM    LOWER CASE
1400 B$ = ""
1410 S = 2: IF IT = 1 THEN S = 4
1420  FOR I = S TO  LEN (A$)
1430 OB$ = B$:B$ =  MID$ (A$,I,1):B =  ASC (B$)
1440  IF B > 64 AND B < 91 AND OB$ <  > " " AND OB$ <  > "." THEN A$ =  LEFT$
     (A$,I - 1) +  CHR$ (B + 32) +  MID$ (A$,I + 1)
1450  NEXT I
1460  REM  PRINTER OUTPUT
1470  FOR I = 1 TO  LEN (A$)
1480  IF  MID$ (A$,I,1) = OO$ THEN A$ =  LEFT$ (A$,I - 1) + PO$ +  MID$ (A
     $,I + 1)
1490  NEXT
1500  PRINT A$: RETURN
1510  REM  VALIDATE A NUMBER
1520 V = 1
1530  IF  VAL (R$) = 0 AND R$ >  <  STR$ ( VAL (R$)) THEN V = 0
```


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PROGRAMS

```
1540  RETURN
2000  REM
            ENTER INPUTS

2010 OT$ = "INPUTS FOR " + Y$ + SP$ +  LEFT$ (SP$,25)
2020  HOME : PRINT OT$;
2030  INVERSE
2040  PRINT T1$
2050  VTAB 24: PRINT B1$;: POKE 2039,32
2060  VTAB 6
2070  NORMAL
2080  POKE 34,5: POKE 35,23: REM  SET WINDOW
2090 FL = 0
2100  HTAB 1: CALL CE: HTAB 21: PRINT "]";:VP =  PEEK (37) + 1: HTAB 1: INPUT
      "";R$
2110  IF  LEFT$ (R$,2) <  > "*D" THEN 2150
2120  IF FL = 1 AND REC(M) > 0 THEN REC(M) = REC(M) - 1: VTAB VP: HTAB 1: CALL
      CE: IF VP > 6 THEN  VTAB VP - 2: CALL CE
2130  IF FL = 0 THEN ER = 1: GOSUB 1150
2140 FL = 0: GOTO 2100
2150 FL = 1
2160  IF  LEFT$ (R$,2) = "*H" THEN  GOSUB 1170:: PRINT H1$;: GOSUB 1270: GOSUB
      1170: GOSUB 1270: PRINT H2$;: POKE 1159,14: HTAB 40: GET R$: GOSUB 11
      70: PRINT OT$: VTAB VP: GOTO 2100
2170  IF  LEFT$ (R$,2) = "*E" THEN 2610
2180  IF  LEN (R$) > 20 THEN ER = 2: GOSUB 1150: GOTO 2100
2190  IF R$ = "" THEN R$ = OI$
2200 OI$ = R$
2210 VP =  PEEK (37)
2220 VA = 1
2230  VTAB VP: HTAB 1: PRINT  LEFT$ (OI$,10);: CALL CS
2240 CO = 1
2250  HTAB CO(CO)
2260  INPUT "";R$
2270  VTAB VP
2280  IF R$ = "" THEN CO = CO + 1 - 3 * (CO = 3): GOTO 2250
2290  GOSUB 1510: IF  VAL (R$) >  = 10 ^ (3 + (CO > 1)) OR V = 0 THEN 2230

2300  IF  RIGHT$ (R$,1) = "N" THEN VA = 0
2310 B =  VAL (R$):DIG = 7 - (CO = 1): GOSUB 1180: HTAB CO(CO): PRINT B$;:
      CO$ = B$
2320  IF CO <  > 2 OR VA = 0 THEN 2380
2330  HTAB CO(3): PRINT "VATABLE ? ";
2340  INVERSE
2350  GET R$: IF R$ <  > "Y" AND R$ <  > "N" THEN 2350
2360  HTAB CO(3): IF R$ = "N" THEN  PRINT NV$;:VA = 0: GOTO 2380
2370  PRINT YV$;
2380  NORMAL : CALL CE: GOSUB 2390: GOTO 2530
2390  REM -------DATE------------
2400  HTAB 36: VTAB VP: CALL CE
2410  INPUT "";DD$
2420  IF  VAL (DD$) < 1 OR  VAL (DD$) > 31 THEN 2400
2430 DD$ =  RIGHT$ (SP$ +  STR$ ( VAL (DD$)),2): VTAB VP: HTAB 36: PRINT D
      D$;" ";
2440  HTAB 39: VTAB VP: CALL CE
2450  INPUT "";MM$
2455  IF VP > 21 AND  LEN (MM$) > 1 THEN VP = VP - 1
2460  IF  VAL (MM$) < 1 OR  VAL (MM$) > 12 THEN 2440
2470 MM$ =  RIGHT$ (SP$ +  STR$ ( VAL (MM$)),2): VTAB VP: HTAB 39: PRINT M
      M$; LEFT$ (SP$,10)
2480 DIG = 6:B =  VAL (CO$) / SN: GOSUB 1180:VA$ = B$: IF VA = 0 THEN VA$ =
       LEFT$ (SP$,6)
2490 DA$ = DD$
2500  IF  ASC (MM$) = 32 THEN MM$ = Z1$ +  MID$ (MM$,2)
2510  IF  ASC (DD$) = 32 THEN DD$ = Z1$ +  MID$ (DD$,2)
2520  RETURN
2530  FOR I = 1 TO 3:CO$(I) =  LEFT$ (SP$,LC(I)): NEXT :CO$(CO) = CO$
2540 IT$ =  LEFT$ (OI$ + SP$,20)
2550 REC$ = Y$ + MM$ + DD$ + DA$ + S$ + IT$ + S$ + CO$(1) + S$ + CO$(2) +
      S$ + CO$(3) + S$ + VA$ +  STR$ (VA)
2560 M =  VAL (MM$)
2570 OM(M) = 1
2580 REC(M) = REC(M) + 1:REC$(M,REC(M)) = REC$
2590  IF MO$ = "2" THEN  RETURN
2600  GOTO 2100
2610  FOR M = 1 TO 12: IF OM(M) = 0 THEN 2640
2620  FOR I = 1 TO REC(M):TEMP$(0,I) = REC$(M,I): NEXT :N = REC(M): GOSUB
      2660
```


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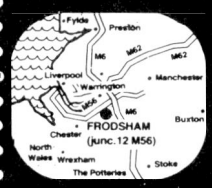

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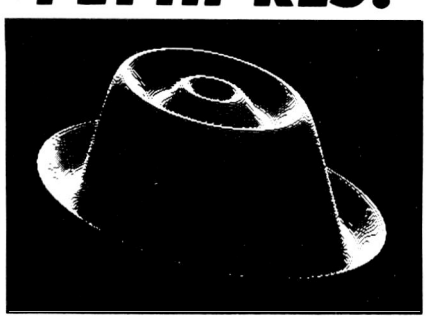

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PROGRAMS

```
2630  FOR I = 1 TO N:REC$(M,I) = TEMP$(1,I): NEXT
2640 OM(M) = 0: NEXT M
2650  RETURN
2660  REM  ***** SORT *****
2670  REM  TEMP$(0,50)->TEMP$(1,50)
2680  REM  N RECORDS
2690 TEMP$(1,1) = TEMP$(0,1)
2700  IF N < 2 THEN 2790
2710  FOR AI = 2 TO N
2720  VTAB 1: HTAB 37: PRINT AI;
2730 BI = AI: VTAB 1: HTAB 36: PRINT "L"
2740 BI = BI - 1
2750  IF TEMP$(1,BI) > TEMP$(0,AI) THEN 2740
2760  VTAB 1: HTAB 36: PRINT "I": FOR I = AI + 1 TO BI STEP  - 1:TEMP$(1,I
      + 1) = TEMP$(1,I): NEXT I
2770 TEMP$(1,BI + 1) = TEMP$(0,AI): NEXT AI
2780  VTAB 1: HTAB 36: PRINT "FIN "
2790  RETURN
3000  REM
            EXAMINE/EDIT INPUTS

3010  FOR M = 1 TO 11: IF REC(M) = 0 THEN  NEXT
3020 OT$ = "INPUTS FOR YEAR " + Y$ + " MONTH " + MN$(M) +  LEFT$ (SP$,10) +
      SP$
3030 J = M
3040  GOSUB 1160
3050  HOME : PRINT OT$;: INVERSE : PRINT T2$: VTAB 22: PRINT B2$;: NORMAL
      : POKE 2039,32
3060  POKE 34,4: POKE 35,21
3070  VTAB 5: PRINT
3080  IF REC(M) < 1 THEN 3130
3090  FOR I = 1 TO REC(M)
3100  IF NU THEN  INVERSE : PRINT  RIGHT$ (SP$ +  STR$ (I),2);: NORMAL
3110  PRINT  MID$ (REC$(M,I),12,10 - 2 * NU); MID$ (REC$(M,I),32,30)
3120  NEXT I
3130  GOSUB 1280
3140  IF R$ <  > "E" THEN 3020
3150  IF REC(M) < 1 THEN ER = 4:VP = 1: GOSUB 1150: GOTO 3020
3160  GOSUB 1170: PRINT "YOU MUST ERASE THE RECORD AND REENTER IT"
3170  GOSUB 1270
3180  GOSUB 1170: PRINT "DO YOU WANT TO DO THIS ? ";: GET R$
3190  IF R$ <  > "Y" THEN 3020
3200  GOSUB 1170: INPUT "ERASE ITEM £";R$: IF R$ <  >  STR$ ( VAL (R$)) THEN
      3200
3210 R =  VAL (R$)
3220  IF R = 0 THEN 3020
3230  IF R > REC(M) THEN ER = 4: GOSUB 1150: GOTO 3020
3240  FOR I = R TO REC(M) - 1
3250 REC$(M,I) = REC$(M,I + 1): NEXT I
3260 REC(M) = REC(M) - 1: GOSUB 1160
3270  GOSUB 2000
3280 M = J
3290  GOTO 3020
3300  RETURN
4000  REM
            ENTER OUTPUTS

4010  HOME
4020 OT$ = "OUTPUTS FOR " + Y$ + "                    "
4030  PRINT OT$
4040  INVERSE : PRINT T3$: VTAB 24: PRINT B1$;: POKE 2039,32
4050  POKE 34,5: POKE 35,23
4060  NORMAL : VTAB 6
4070  HTAB 1: CALL CE: HTAB 21: PRINT "]";:VP =  PEEK (37) + 1: HTAB 1: INPUT
      "";R$
4080  IF  LEFT$ (R$,2) <  > "*D" THEN 4120
4090  IF FL = 1 AND NO(M) > 0 THEN NO(M) = NO(M) - 1: VTAB VP: HTAB 1: CALL
      CE: IF VP > 6 THEN  VTAB VP - 2: CALL CE
4100  IF FL = 0 THEN ER = 1: GOSUB 1150
4110 FL = 0: GOTO 4070
4120 FL = 1
4130  IF  LEFT$ (R$,2) <  > "*H" THEN 4160
4140  GOSUB 1170: PRINT H1$;: GET R$
4150  GOSUB 1170: PRINT OT$;: CALL CE: PRINT : INVERSE : PRINT TL$: NORMAL
      : VTAB VP: GOTO 4070
4160  IF  LEFT$ (R$,2) = "*E" THEN 4380
4170  IF  LEFT$ (R$,2) = "*S" THEN  FOR I = 1 TO 12:OM(I) = 1: NEXT : GOTO
      4380
```


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PROGRAMS

```
4180  IF  LEN (R$) > 20 THEN ER = 2: GOSUB 1150: GOTO 4070
4190  IF R$ = "" THEN R$ = OO$
4200 OO$ = R$
4210 VP =  PEEK (37)
4220  VTAB VP: HTAB 11: CALL CS: INPUT " ";R$
4225 VT = 1: IF  RIGHT$ (R$,1) = "N" THEN VT = 0:R$ =  LEFT$ (R$, LEN (R$)
     - 1)
4230  GOSUB 1510: IF V = 0 THEN 4220
4240  VTAB VP
4250 B =  VAL (R$):DIG = 7: GOSUB 1180: HTAB 12: PRINT B$;:IN =  VAL (B$):
     IN$ = B$
4260 VT = VT * IN * RV / 100:IT = VT + IN
4270 B = VT: GOSUB 1180
4280  PRINT " ";B$;:VT$ = B$
4290 B = IT: GOSUB 1180
4300  PRINT " ";B$;:IT$ = B$
4310  GOSUB 2390
4320 CL$ =  LEFT$ (OO$ + SP$,20)
4330 M =  VAL (MM$)
4340 OP$ = Y$ + MM$ + DD$ + DA$ + " " + CL$ + " " + IN$ + " " + VT$ + " " +
     IT$
4350 NO(M) = NO(M) + 1:OP$(M,NO(M)) = OP$
4360 OM(M) = 1
4370  GOTO 4070
4380  REM  SORT
4390  FOR M = 1 TO 12: IF OM(M) = 0 THEN 4420
4400  FOR I = 1 TO NO(M):TEMP$(0,I) = OP$(M,I): NEXT :N = NO(M): GOSUB 266
     0
4410  FOR I = 1 TO N:OP$(M,I) = TEMP$(1,I): NEXT
4420 OM(M) = 0: NEXT M
4430  RETURN
5000  REM
              EXAMINE/EDIT OUTPUTS
5010  FOR M = 1 TO 11: IF NO(M) = 0 THEN  NEXT M
5020 DIG = 7
5030 OT$ = "OUTPUTS FOR YEAR " + Y$ + " MONTH " + MN$(M) +  LEFT$ (SP$,9) +
     SP$
5040  GOSUB 1160: HOME : PRINT OT$;
5050  INVERSE : PRINT T4$: VTAB 22: PRINT B2$;: NORMAL : POKE 2039,32
5060  POKE 34,4: POKE 35,21
5070  VTAB 5
5080  IF NO(M) < 1 THEN 5140
5090  FOR I = 1 TO NO(M)
5100  PRINT
5110  IF NU THEN  INVERSE : PRINT  RIGHT$ (SP$ +  STR$ (I),2);: NORMAL
5120  PRINT  MID$ (OP$(M,I),9,15 - 2 * NU); MID$ (OP$(M,I),31)
5130  NEXT I
5140  GOSUB 1280
5150  IF R <  > 69 THEN 5030
5160  IF NO(M) < 1 THEN ER = 4:VP = 1: GOSUB 1150: GOTO 5030
5170  GOSUB 1170: PRINT "EDIT ITEM £";
5180  GET R$:R =  VAL (R$): IF R$ <  >  STR$ (R) THEN ER = 3:VP = 1: GOSUB
     1150: GOTO 5170
5190  IF R > NO(M) THEN ER = 4: GOSUB 1150: GOTO 5030
5200 I = R: IF R = 0 THEN 5030
5210  PRINT R$;" ARE YOU SURE ? ";: GET R$
5220  IF R$ <  > "Y" THEN 5170
5230 J = I
5240 OP$ = OP$(M,I): GOSUB 1170: PRINT "CLIENT:"; MID$ (OP$,12,20);"]": PRINT
     MS$: VTAB 1: HTAB 8: INPUT "";CL$
5250  IF CL$ = "" THEN CL$ =  MID$ (OP$,12,20)
5260  IF  LEFT$ (CL$,2) <  > "*D" THEN 5310
5270  FOR I = J TO NO(M) - 1
5280 OP$(M,I) = OP$(M,I + 1): NEXT I
5290 NO(M) = NO(M) - 1
5300  GOTO 5030
5310 CL$ =  LEFT$ (CL$ + SP$,20)
5320  VTAB 1: HTAB 8: PRINT CL$;: CALL CE: PRINT : CALL CE: GOSUB 1270
5330  GOSUB 1170: PRINT "NET FEE:"; MID$ (OP$,33,7);MS$;: CALL CE
5340  HTAB 9: VTAB 1: INPUT "";IN$: IF IN$ = "" THEN IN$ =  MID$ (OP$,33,7
     )
5350 B =  VAL (IN$):DIG = 7: GOSUB 1180:IN$ = B$
5360  VTAB 1: HTAB 9: PRINT IN$;: CALL CE: GOSUB 1270
5370  HTAB 19: PRINT "AND NOW THE DATE:";:VP = 1
5380  HTAB 36: VTAB 2: PRINT  MID$ (OP$,9,2);" "; RIGHT$ (SP$ +  STR$ ( VAL
     ( MID$ (OP$,5,2))),2)
5390  GOSUB 2390
5400  GOSUB 1270: HTAB 1: VTAB 2: CALL CE: PRINT "OKAY ? ";: GET R$
```


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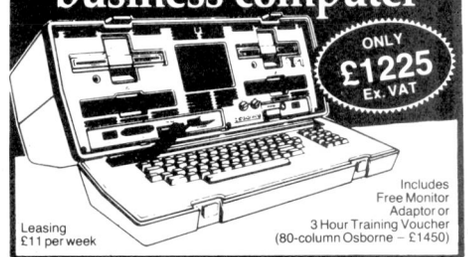

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PROGRAMS

```
5410  IF R$ >  < "Y" THEN 5030
5420 DIG = 7:B =  VAL (IN$) * RV / 100: GOSUB 1180:VT$ = B$
5430 B =  VAL (IN$) * (1 + RV / 100): GOSUB 1180:IT$ = B$
5440 OP$ = Y$ + MM$ + DD$ + DA$ + S$ + CL$ + S$ + IN$ + S$ + VT$ + S$ + IT
     $
5450 I = J
5460  IF M <  >  VAL (MM$) THEN 5480
5470 OP$(M,I) = OP$:OM(M) = 1: GOSUB 4380:M =  VAL (MM$): GOTO 5030
5480  FOR J = I TO NO(M)
5490 OP$(M,J) = OP$(M,J + 1): NEXT J
5500 NO(M) = NO(M) - 1:J = M
5510 M =  VAL (MM$):NO(M) = NO(M) + 1:OM(M) = 1
5520 OP$(M,NO(M)) = OP$
5530  GOSUB 4380:M = J
5540  GOTO 5030
6000  REM
            UPDATE DISKETTE

6010  PRINT : POKE 34,22: POKE 35,24
6020  PRINT D$;"MON C,I,O"
6030  FOR M = 1 TO 12
6040  IF REC(M) < 1 THEN 6160
6050  REM  INPUTS
6060 F$ = MN$(M) + " " + Y$ + ".INP"
6070  PRINT
6080  PRINT D$;"OPEN";F$: PRINT D$;"DELETE";F$
6090  PRINT D$;"OPEN";F$: PRINT D$;"WRITE";F$
6100  IF REC(M) = 0 THEN 6140
6110  FOR I = 1 TO REC(M)
6120  PRINT REC$(M,I)
6130  NEXT I
6140  PRINT "*"
6150  PRINT D$;"CLOSE";F$
6160  REM  OUTPUTS
6170  IF NO(M) < 1 THEN 6260
6180 F$ = MN$(M) + S$ + Y$ + ".OUT"
6190  PRINT D$;"OPEN";F$: PRINT D$;"WRITE";F$
6200  IF NO(M) = 0 THEN 6240
6210  FOR I = 1 TO NO(M)
6220  PRINT OP$(M,I)
6230  NEXT I
6240  PRINT "*"
6250  PRINT D$;"CLOSE";F$
6260  NEXT M
6270  RETURN
7000  REM
            PRINTOUT

7010 P1$ = "DATE      ITEMS                MATERIAL EXTERNAL  CAPITAL
     V.A.T."
7020 P2$ = "                               &  TOOLS SERVICES  EQUIPMT
     @  " + RV$
7030  FOR I = 1 TO 13:TT(I) = 0: NEXT
7040  HOME : PRINT "CHOOSE THE QUARTER YOU WANT...."
7050  PRINT : PRINT : PRINT : FOR I = 1 TO 4: INVERSE : HTAB 5: PRINT I;: NORMAL
  : HTAB 10: PRINT QT$(I): PRINT : NEXT
7060  HTAB 5: INVERSE : PRINT I;: NORMAL : HTAB 10: PRINT "RETURN TO MENU"

7070  VTAB 19: PRINT : PRINT "ENTER YOUR CHOICE:";: GET R$: IF R$ < "1" OR
     R$ > "5" THEN 7070
7080  INVERSE : PRINT R$: NORMAL
7090  IF R$ = "5" THEN  RETURN
7100 QT =  VAL (R$):SM = QT * 3 + QS - 3
7110 OU$ = "PRINTER"
7120  PRINT D$;"PR£1"
7130  REM  -----PRINT INPUTS-----
7140  PRINT :A$ = P1$: GOSUB 1390:A$ = P2$: GOSUB 1390: PRINT LI$
7150  FOR MC = 0 TO 2:M =  FN M(SM + MC)
7160  GOSUB 1260
7170  IF REC(M) = 0 THEN 7250
7180  FOR IT = 1 TO REC(M): GOSUB 1340
7190 A$ = TREC$: GOSUB 1390
7200  FOR I = 1 TO 3:ST(I) = ST(I) +  FN C(I):ST(I + 3) = ST(I + 3) +  FN
     C(I) * ( FN V(0) > 0):ST(6 + I) = ST(3 + I) / SN:ST(10 + I) = ST(I) -
     ST(6 + I): NEXT I
7210 ST(10) = ST(10) +  FN V(0)
7220  NEXT IT
7230  PRINT LI$
```


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PROGRAMS

```
7240  REM  ----MONTHLY TOTALS----
7250 DIG = 8
7260  FOR J = 1 TO 4
7270 A$ = MN$(M - M * (J > 1)) + TT$(J) + S9$
7280  FOR I = 1 TO 3
7290 B = ST(J * 3 - 3 + I + (J > 3)): GOSUB 1180
7300 A$ = A$ + B$ + S$
7310  NEXT I
7320  IF J = 3 THEN B = ST(10): GOSUB 1180:A$ = A$ + S$ + S$ + B$
7330  GOSUB 1460: NEXT J
7340  PRINT LI$
7350  FOR J = 1 TO 13:TT(J) = TT(J) + ST(J): NEXT J
7360  NEXT MC
7370  REM  ---QUARTERLY TOTALS---
7380  FOR J = 1 TO 4
7390 A$ =  MID$ (SP$ + QT$(QT),30 + 11 * (J = 1) + (J = 0),11) + TT$(J)
7400  FOR I = 1 TO 3 + (J = 3)
7410 B = TT(I + (J - 1) * 3 + (J > 3)): GOSUB 1180:A$ = A$ + S$ + B$: IF J
      = 3 AND I = 3 THEN A$ = A$ + S$ + S$
7420  NEXT I: GOSUB 1460: NEXT J
7430  PRINT LI$: PRINT : PRINT D$;"PR£0"
7440  PRINT : PRINT "NOW PREPARE FOR THE OUTPUTS.": GOSUB 1270: PRINT "PRE
     SS A KEY TO COMMENCE PRINTING.....";: GET R$
7450  PRINT
7460  PRINT D$;"PR£1"
7470 A$ = T5$ +  MID$ (T4$,18,23): GOSUB 1390
7480 A$ =  LEFT$ (SP$,31) +  MID$ (T4$,58): GOSUB 1390
7490  PRINT LI$
7500  FOR MC = 0 TO 2:M =  FN M(MC + SM)
7510  GOSUB 1260
7520  IF NO(M) = 0 THEN 7600
7530  FOR IT = 1 TO NO(M)
7540 A$ = S3$
7550  IF IT = 1 THEN A$ = MN$(M)
7560 A$ = A$ + S3$ +  MID$ (OP$(M,IT),9,24) +  MID$ (OP$(M,IT),32)
7570  GOSUB 1390
7580  FOR J = 1 TO 3:ST(J) = ST(J) +  VAL ( MID$ (OP$(M,IT),J * 8 + 25,7))
     : NEXT J
7590  NEXT IT
7600  IF REC(M) = NO(M) THEN 7630
7610  FOR I = 1 TO REC(M) - NO(M): PRINT : FOR J = 1 TO 200: NEXT J,I
7620  PRINT LI$
7630  REM  --------TOTALS--------
7640 A$ = MN$(M) + S3$ + "TOTALS" +  LEFT$ (SP$,18)
7650  FOR J = 1 TO 3:DIG = 7:B = ST(J):TT(J) = TT(J) + B: GOSUB 1180:A$ =
     A$ + " " + B$: NEXT J
7660  GOSUB 1460
7670  FOR J = 1 TO 3: PRINT : FOR I = 1 TO 200: NEXT I,J
7680  PRINT LI$
7690  NEXT MC
7700  REM -----OUTPUT TOTALS-----
7710 A$ = QT$(QT) + S3$ + "TOTALS" +  LEFT$ (SP$,10)
7720  FOR J = 1 TO 3:DIG = 8:B = TT(J): GOSUB 1180:A$ = A$ + B$: NEXT J
7730  GOSUB 1460
7740  FOR J = 1 TO 3:A$ = "": GOSUB 1460: NEXT
7750  PRINT LI$
7760  PRINT : PRINT D$;"PR£0"
7770  RETURN
8000  REM  READ IN FILES
8010  VTAB 10: HTAB 5: PRINT "READING:"
8020  VTAB 12: HTAB 5: PRINT "INPUTS:0": VTAB 14: HTAB 5: PRINT "OUTPUTS:0
     "
8030  FOR M = 1 TO 12
8040  REM  INPUTS
8050 F$ = MN$(M) + " " + Y$ + ".INP"
8060  VTAB 10: HTAB 13: PRINT F$
8070  PRINT D$;"OPEN";F$: PRINT D$;"READ";F$
8080  INPUT R$
8090  IF R$ = "*" THEN 8140
8100 REC(M) = REC(M) + 1
8110 RE = RE + 1: VTAB 12: HTAB 12: PRINT RE
8120 REC$(M,REC(M)) = R$
8130  GOTO 8080
8140  PRINT D$;"CLOSE"
8150  REM  OUTPUTS
8160 F$ = MN$(M) + " " + Y$ + ".OUT"
8170  VTAB 10: HTAB 13: PRINT F$
8180  PRINT D$;"OPEN";F$: PRINT D$;"READ";F$
```


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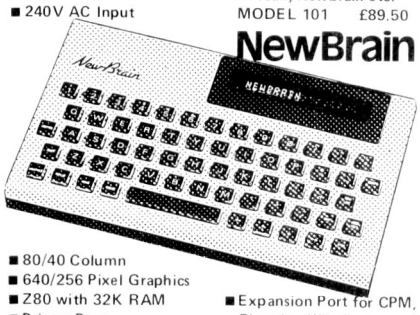

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PROGRAMS

```
8190  INPUT R$
8200  IF R$ = "*" THEN 8250
8210 NO(M) = NO(M) + 1
8220 NO = NO + 1: VTAB 14: HTAB 13: PRINT NO
8230 OP$(M,NO(M)) = R$
8240  GOTO 8190
8250  PRINT D$;"CLOSE"
8260  NEXT M
8270  RETURN
9000  REM   INITIALISE DISK
9010  HOME : VTAB 6
9020  INVERSE : PRINT " PREPARING TO INITIALISE " + Y$ + "'S RECORDS "
9030  NORMAL
9040  PRINT : PRINT "  THIS INVOLVES WIPING OUT THE RECORDS"
9050  PRINT : PRINT "  FOR ";Y$
9060  PRINT : PRINT : INPUT " DO YOU MIND THIS ? ";R$
9070  IF  ASC (R$) <  > 78 THEN  RETURN
9080  HOME : PRINT "INITIALISING INPUTS"
9090 R$ = "INP"
9100  FOR M = 1 TO 12
9110 F$ = MN$(M) + " " + Y$ + "." + R$
9120  PRINT : PRINT F$
9130  PRINT D$;"OPEN";F$
9140  PRINT D$;"DELETE";F$
9150  PRINT D$;"OPEN";F$
9160  PRINT D$;"WRITE";F$
9170  PRINT "*"
9180  PRINT D$;"CLOSE";F$
9190  NEXT M
9200  IF R$ = "INP" THEN R$ = "OUT": HOME : PRINT "INITIALISING OUTPUTS": GOTO
      9100
9210  PRINT : PRINT : PRINT "PRESS A KEY TO CONTINUE.....";: GET
      R$
9220  RETURN
```

MZ-80k Trains

Adapted by Frank Rooney from a PET program by Jeff Aughton.

PET owners may remember Jeff Aughton's 'Trains' in the October '82 issue of *PCW*. This program is an adaptation for the Sharp MZ-80k.

A grid is drawn on the screen to represent a railway network with between ten and sixteen points depending upon the skill level chosen (1-3). The idea is to manipulate these points, using the keys A to R, in order to prevent a rapidly increasing number of trains from either colliding or derailing at open points. Just to keep you on your toes, the points will take it upon themselves to close down for repairs at random intervals. You are scored on the length of time you manage to control the network without killing any passengers!

It's a highly addictive game requiring fast reactions and the ability to keep an eye on several different parts of the screen at the same time. There's a sub-routine at line 930 which prints a message congratulating you on having survived for longer than five minutes; the only place I've seen this message is in the listing. . .

```
10 REM              T R A I N S
11 REM   By Jeff Aughton - PCW 10.82
12 REM     Adapted for SHARP MZ-80K
13 REM           By Frank Rooney
30 TEMPO6:DIMA$(12),P(18),T(8,3)
40 GOSUB1160
50 F=0:M=1:U=1:X=67:Y=72:Z=53248
60 D$="
70 A$(0)="
80 A$(1)="
90 A$(2)="
100 A$(3)="
110 A$(4)="
120 A$(5)="":A$(7)=""
130 A$(6)="
140 A$(8)="
150 A$(9)="
160 A$(10)="
```


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PROGRAMS

```
170 A$(11)="■■ ▲■■■■ ◢■"
180 A$(12)="◢■ ■■■■▼ ▲■■■■ ◢■"
190 Z$="■":FORI=1TO39:Z$=Z$+" "
200 NEXT:Z$=Z$+"■"
210 IFV<.2THENA$(2)="■■ ■■■■■■■■ "
220 IFV<.4THENA$(8)=" ■ ■■■■■■■"
230 FORI=1TO8:T(I,1)=203:T(I,2)=-1
240 T(I,3)=X:NEXT
250 PRINT"■■":FORI=1TO3
260 GOSUB960:FORJ=1TO6
270 GOSUB1010:PRINT"■":NEXTJ,I
280 GOSUB960
290 POKE53329,78:POKE53365,77
300 POKE54169,66:POKE54205,86
310 FORI=0TO10:READJ:POKEZ+J,54:NEXT
320 FORI=65TO82:K$=CHR$(I)
330 GOSUB1030:IFP(A)=5THENNEXT
340 IFRND(1)<.5THENP(A)=12-P(A)
350 PRINT"■";K$;"■■";A$(P(A)):NEXT
360 PRINT"■■■■■■■■
```

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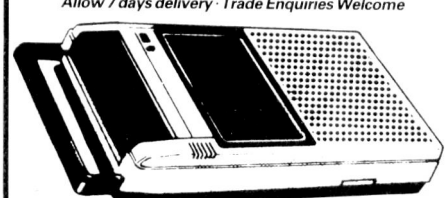

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PROGRAMS

```
1020 PRINT"■          ";:NEXT:RETURN
1030 A=ASC(K$)-64
1040 R=INT(A/5):C=9*(A-5*R)
1050 PRINTLEFT$(D$,2+7*R);TAB(C);
1060 RETURN
1070 DATA-41,-40,-39,1,41,40,39,1,0
1080 DATA1,1,5,5,5,0,0,0,5
1090 DATA2,5,0,5,3,5,4,5,4
1100 DATA1,1,1,5,5,0,5,0,3
1110 DATA2,0,0,5,5,5,5,4,4
1120 DATA1,1,1,5,2,0,0,0,3
1130 DATA2,0,0,0,3,5,4,4,4,0
1140 DATA50,59,68,200,360,398
1150 DATA640,678,970,979,988
1160 PRINT"■■■■■"
1170 K$="   000000":GOSUB620:PRINT
1180 K$="    TRAINS":GOSUB620:PRINT
1190 K$="   000000":GOSUB620:PRINT
1200 PRINT"■■■■■■        Press <SPACE> whenever you"
1210 PRINT"■           are ready to continue"
1220 GOSUB650
1230 PRINT"Try to control the trains (0) as they go"
1240 PRINT"round the system. Each of the points■"
1250 PRINT"is labelled with a letter A-R. You can■"
1260 PRINT"switch the points by pressing the key■"
1270 PRINT"having the same letter. Keep them moving"
1280 PRINT"as long as you can!!■■"
1290 PRINT"In the event of any accidents, the game■"
1300 PRINT"stops and your score is given.■■"
1310 PRINT"At irregular intervals some points may■"
1320 PRINT"close for a while for repairs. Keep an■"
1330 PRINT"eye on the top of the screen for details■"
1340 GOSUB650
1350 PRINT"■■Select skill level:■■"
1360 PRINT"          1 = EASY .... 3 = HARD■■"
1370 PRINT"          Press <1>, <2> or <3>"
1380 GETV
1390 IF(V<1)+(V>3)THEN1380
1400 PRINT"■";:FORI=1TO9+18*(V-1):READS:NEXT
1410 FORI=1TO18:READP(I):NEXT
1420 FORI=0TO18*(3-V):READS:NEXT
1430 N=2+2*V:V=V/7:RETURN
```

Oric 1 Titles

by Keith Ollet

(A Sloppy Software Production)

Ever wanted to start your own computer mag? Stumped for a title that hasn't already been used by one of the other 254 x 100 mags around? Well, CLOAD "TITLES",S, relax your brain and let the Oric take the strain. . . (Not sure that *Adult Bondage & games* would make a suitable title for a computer magazine, but there's no accounting for taste I suppose.)

```
1000 FOR I=0 TO 5: READ A1$(I): NEXT
1010 FOR I=0 TO 2: READ A2$(I): NEXT
1020 FOR I=0 TO 6: READ A3$(I): NEXT
1030 DEF FNA(X)=INT(RND(1)*X)
1040 DATA ADULT, YOUR, DOMESTIC, HOME, PERSONAL, ELECTRONICS &
1050 DATA COMPUTER, COMPUTING, BONDAGE
1060 DATA WEEKLY, MONTHLY, NEWS, WORLD, TIMES, EXPRESS, & GAMES
1070 CLS
1080 REPEAT
1090 PRINT A1$(FNA(6));" ";A2$(FNA(3));" ";A3$(FNA(8)
1100 UNTIL KEY$=CHR$(32)
1110 REPEAT: UNTIL KEY$=CHR$(13)
1120 GOTO 1080
```


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PROGRAMS

PET Zombies

by P Barker

'Zombies' is a PET version of the arcade game. A number of zombies converge steadily towards you, their one goal in life (?) to zombify you. Your only defence is to lure the zombies into the open graves dotted around the screen and thus postpone your eventual zombification for as long as possible. You can have anything between 20 and 50 zombies, and you control your movements via the number keys as explained in the program. If you avoid your horrendous fate for longer than five minutes, I reckon that's pretty good going.

```
1 POKE59468,12
10 POKE59454,0:POKE59467,16:POKE59466,15:REM SOUND BOX ON
20 FORI=1TO9:READD0%(I),D1%(I):NEXT
100 PRINT"■                ZOMBIES"
110 PRINT"                 ──────"
120 PRINT"■        YOU  ARE  IN  A  GRAVEYARD  THE";
130 PRINT"CHURCH CLOCK HAS JUST  STRUCK ■MIDNIGHT■ !"
140 PRINT"YOU MUST EVADE THE ZOMBIES FOR  AS  LONG";
150 PRINT"AS  POSIBLE  BY  LURING  THEM INTO  OPEN";
160 PRINT"GRAVES (■   ■). BUT IF YOU ARE CAUGHT THEN";
170 PRINT"YOU ARE ■ZOMBIEFYED■.KEYBOARD COMMANDS :-"
180 PRINT"■                7   8   9
190 PRINT"■                 \  |  /
200 PRINT"■                  4 - 5 - 6
210 PRINT"■                 /  |  \
220 PRINT"■                1   2   3
230 PRINT"■PRESS  SPACE  TO  PLAY  ■ZOMBIES■"
240 GETA$:IFA$<>" "THEN240
1000 PRINT"■■■
```

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PROGRAMS

```
3100 ZX(J,0)=ZX(J,0)-SGN(ZX(J,0)-00)
3110 ZX(J,1)=ZX(J,1)-SGN(ZX(J,1)-01)
3120 P=SS+ZX(J,0)+(ZX(J,1)*SW)
3130 IFPEEK(P)=81THEN3700
3140 IFPEEK(P)=160THEN3500
3150 POKEP,42
3160 NEXT:GOTO3010
3500 FORI=200TO0STEP-10:POKE59464,I:NEXT
3510 IFPEEK(P)=160THENP=P-1:GOTO3510
3520 POKEP+1,230:POKEP+2,230:POKEP+3,220
3530 ZX(J,0)=ZX(Z,0)
3540 ZX(J,1)=ZX(Z,1)
3550 Z=Z-1
3560 IFZ<1THENGOSUB2000:NS=NS+1:NT=NS:Z=Z+INT(RND(0)*5):IFZ>49THENZ=49
3565 IFZ<NTTHENNT=Z
3570 GOTO3010
3700 POKE54964,255
3710 FORI=0TO30:POKE59464,255:POKE0,42:POKE59464,200:POKE0,81:NEXT
3720 POKE59464,0
3730 GETA$:IFA$<>""THEN3730
4000 T=INT(TI/60/10:PRINT"■■■■YOU HAVE SURVIVED FOR"T"SECONDS"
4010 IFT<HSTHEN4040
4020 PRINT"■YOU HAVE SURVIVED LONGEST":IFHS=0THENHS=T:GOTO4050
4030 PRINT"■THE PREVIOUS BEST TIME WAS"HS"SECONDS":HS=T:GOTO4050
4040 PRINT"■THE BEST TIME IS STILL"HS"SECONDS"
4050 RETURN
5000 DATA-1,1,0,1,1,1
5010 DATA-1,0,0,0,1,0
5020 DATA-1,-1,0,-1,1,-1
```

Commodore 64 Sprite editor

by A R Bennet

A Sprite, for the unenlightened, is a programmable graphics object 24 pixels by 21 pixels — a sort of high resolution user-definable character. Working out the codes for these little creatures (or planes/missiles/space invaders/etc) is normally a boring and time-consuming task. This editor, however, allows you to 'draw' your sprites on the screen using a joystick, so you can design hundreds of weird and wonderful creations quickly and painlessly. You simply draw your design, enlarge it along either axis as you wish and then let the editor produce the appropriate code which it will helpfully place into DATA statements for you.

To quote Simon Rockman, who checked the program for *PCW*, the editor is '. . .very nice to use, does the job perfectly and is better than the one I bought. I will be using this version in future.'

The joystick, by the way, must be connected to port 2.

```
10 REM **********************
20 REM **  COMMODORE 64  **
30 REM **  SPRITE EDITOR **
40 REM ** BY A.R.BENNETT **
50 REM **  (C) 18/1/83   **
55 REM **********************
60 POKE53280,6:POKE53281,6:PRINT"■■■■■■■■■■■■■■DO YOU WANT INSTRUCTIONS (Y/N)
62 GETA1$:IFA1$=""THEN62
63 IFA1$="Y"THEN30000
64 REM ** SET-UP **
65 DIMMN(65)
66 PEN=1:SP=1024+80+1:L=SP:XX=0:YY=0:X=0:Y=0:E$="DRAW":J$(0)="DRAW":W=0:H=160
67 J$(1)="ERASE"
75 XP=1024+27:FORI=0TO8:AK(I)=80*I:NEXT
80 RESTORE
85 PEN=0:REM * PEN COLOUR = BLACK *
90 V=53248:POKEV+21,4:POKEV+16,4:POKEV+23,0:POKEV+29,0:POKEV+4,4:POKEV+5,208
92 FORI=0TO62:POKE704+I,0:NEXT
95 POKEV+27,0:POKE2042,11:POKEV+41,0
99 REM ** PRINT SCREEN **
100 PRINT"■■■■";TAB(13);"■SPRITE EDITOR■"
```


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PROGRAMS

```
110 PRINT"**************************"
120 FORI=1TO21:PRINT"■■                          ■■":NEXTI
130 PRINT"**************************"
131 POKEL,160:POKE(L-1024+55296),0
132 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(15)"■";J$(W);"■ MODE  ■"
140 PRINT"■"
160 PRINTTAB(29);"■ CREATE":PRINTTAB(29);"  SPRITE"
170 PRINTTAB(29);"- ENLARGE":PRINTTAB(29);"  IN X"
180 PRINTTAB(29);"- ENLARGE":PRINTTAB(29);"  IN Y"
190 PRINTTAB(29);"- CREATE":PRINTTAB(29);"  DATA"
200 PRINTTAB(29);"- ERASE/":PRINTTAB(29);" DRAW MODE"
210 PRINTTAB(29);"- MOVE  ":PRINTTAB(29);"  PEN   "
220 PRINTTAB(29);"- DROP  ":PRINTTAB(29);"  PEN   "
230 PRINTTAB(29);"- ESCAPE":PRINTTAB(29);"  SELECT"
240 PRINTTAB(29);"- NEW   ":PRINTTAB(29);"  SPRITE"
249 REM ** JOYSTICK IN PORT 2 **
250 FO=0:JOY=PEEK(56320):POKEL-1024+55296,5:FORWW=1TO8:NEXTWW
251 POKEL-1024+55296,PEN:IF(JOY=127)THEN250
252 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(15)"■";J$(W);"■ MODE  ■"
260 ONFOGOTO3000,2000,2500,1500,2600,10000,5000,250,600
295 IF(JOY<112)THEN7000
310 IF(JOY>112)AND(JOY<127)THEN5000
370 GOTO250
599 REM ** RESTART **
600 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(10)"ARE YOU SURE (Y/N)?■"
610 GETA1$:IFA1$=""THEN610
620 IFA1$="Y"THENRUN
630 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(5)"                              ■"
640 GOTO250
1499 REM ** CREATE/PRINT DATA **
1500 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(5)"WILL ERASE PROGRAM (Y/N)?■"
1510 K=0:A1$="":GETA1$:IFA1$=""THEN1510
1515 IFA1$="Y"THEN1530
1520 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■                              ■":GOTO250
1530 PRINT"■■■";
1535 PRINT"■ ■":PRINTG;"DATA   ■■■";
1550 IFK>62THEN1570
1555 PRINTMN(K);"■,";
1560 K=K+1:IFK/11=INT(K/11)THENG=G+1:GOTO1535
1565 GOTO1550
1570 PRINT"■ ■"
1590 POKEV+21,0:NEW
1999 REM ** CHANGE SPRITE SIZE IN X **
2000 P=PEEK(V+29):POKEV+29,4-P:GOTO250
2499 REM ** CHANGE SPRITE SIZE IN Y **
2500 P=PEEK(V+23):POKEV+23,4-P:GOTO250
2599 REM ** ERASE MODE **
2600 E$=J$(W):W=1-W
2605 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(15)"■";J$(W);"■ MODE  ■"
2610 H=(32+160)-H
2690 GOTO250
2999 REM ** CREATE SPRITE **
3000 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(10)"■CREATING SPRITE■":Q=0:Z=0
3001 FORTY=0TO63:MN(TY)=0:NEXTTY
3002 FORA=0TO20:LK=SP+A*40:FORB=0TO23:LJ=LK+B:AP=PEEK(LJ):B1=(B+1)/8
3003 POKELJ,81:POKELJ,AP
3005 IFSP=1S0THENMN(Z)=MN(Z)+2↑(7-Q)
3010 Q=Q+1
3020 IFB1=INT(B1)THENZ=Z+1:Q=0
3030 NEXT:Q=0:NEXT
3040 FORTY=0TO62:POKE704+TY,MN(TY):NEXT
3045 PRINT"■■■■■■■■■■■■■■■■■■■■■■■■■■■■";TAB(5)"                              ■"
3050 GOTO250
4999 REM ** JOYSTICK MOVE **
5000 JOY=ABS(JOY-127):XX=0:YY=0
5010 IFJOY=8THENXX=+1
5020 IFJOY=4THENXX=-1
5030 IFJOY=1THENYY=-1
5040 IFJOY=2THENYY=+1
5060 F=L+XX+((YY)*40)
5062 IFPEEK(F)=42THEN250
5065 L=L+XX+((YY)*40):X=X+XX:Y=Y+YY
5070 POKEL,87:POKE(L-1024+55296),5:POKEL,W:POKE(L-1024+55296),PEN
5090 GOTO250
6999 REM ** SELECT **
7000 POKEXP+AK(XZ),32
7005 JOY=ABS(PEEK(56320)-111)
7010 IFPEEK(56320)=>112THENFO=XZ+1:XZ=0:GOTO260
```


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PROGRAMS

```
7015 IFJOY=2THENXZ=XZ+1
7020 IFXZ>8THENXZ=0
7030 POKEXP+AK(XZ),62
7040 POKEXP-1024+55296+AK(XZ),0
7100 FORSA=1TO10:NEXTSA:GOTO7000
9999 REM ** MOVE WITHOUT DRAW **
10000 JOY=PEEK(56320):JOY=ABS(JOY-127):XX=0:YY=0
10010 IFJOY=8THENXX=+1
10020 IFJOY=4THENXX=-1
10030 IFJOY=1THENYY=-1
10040 IFJOY=2THENYY=+1
10045 IFJOY>10THEN250
10050 F=L+XX+((YY)*40)
10060 IFPEEK(F)=42THEN10000
10070 L=L+XX+((YY)*40):X=X+XX:Y=Y+YY
10090 KK=PEEK(L):POKEL,30:POKEL,KK
10100 GOTO10000
29992 REM ** THE INSTRUCTIONS MAY BE **
29993 REM ** LEFT OUT WHEN TYPING IN **
29994 REM ** THE PROGRAM BUT SHOULD  **
29995 REM **  READ BEFORE USING THE  **
29996 REM **       SPRITE EDITOR      **
29998 REM
29999 REM ** INSTRUCTIONS **
30000 PRINT"■";TAB(12);"64 SPRITE EDITOR"
30010 PRINTTAB(14);"■INSTRUCTIONS"
30020 PRINTTAB(14);"————————"
30030 PRINT"■■■■■THIS EDITOR ALLOWS YOU TO DRAW A"
30040 PRINT"■■SPRITE ON THE SCREEN USING A JOYSTICK."
30050 PRINT"■■THE EDITOR WILL THEN CREATE THE DATA"
30060 PRINT"■■STATEMENTS TO BE USED IN YOUR SPRITE"
30070 PRINT"■■■PROGRAMS."
30080 GOSUB40000
30090 PRINT"■■■■■■■THE COMMANDS AVAILABLE ARE -"
30110 PRINT"■ ■CREATE SPRITE■ -   EXAMINES WHAT YOU"
30115 PRINT"■■■■■■■■■■■■■■■■■■■■■■HAVE DRAWN AND"
30120 PRINT"■■■■■■■■■■■■■■■■■■■■■■CREATES THE SPRITE."
30130 PRINT"■ ■ENLARGE IN X■ -    CHANGES SIZE OF"
30135 PRINT"■■■■■■■■■■■■■■■■■■■■■■SPRITE IN THE X"
30140 PRINT"■■■■■■■■■■■■■■■■■■■■■■DIRECTION."
30145 PRINT"■ ■ENLARGE IN Y■ -    CHANGES SIZE OF"
30150 PRINT"■■■■■■■■■■■■■■■■■■■■■■SPRITE IN THE Y"
30155 PRINT"■■■■■■■■■■■■■■■■■■■■■■DIRECTION."
30160 PRINT"■ ■CREATE DATA■ -     PRINTS DATA FOR THE"
30165 PRINT"■■■■■■■■■■■■■■■■■■■■■■SPRITE ON THE SCREEN"
30170 PRINT"■■■■■■■■■■■■■■■■■■■■■■AND ERASES PROGRAM."
30175 PRINT"■■■■■■■■■■■■■■■■■■■■■■PRESS THE 'HOME' KEY"
30180 PRINT"■■■■■■■■■■■■■■■■■■■■■■AND THEN PRESS"
30185 PRINT"■■■■■■■■■■■■■■■■■■■■■■'RETURN' SEVEN TIMES"
30190 PRINT"■■■■■■■■■■■■■■■■■■■■■■TO ENTER THE DATA"
30195 PRINT"■■■■■■■■■■■■■■■■■■■■■■STATEMENTS INTO THE"
30197 PRINT"■■■■■■■■■■■■■■■■■■■■■■64.■"
30200 GOSUB40000
30210 PRINT"■■ ■ERASE/DRAW MODE■ - SWITCHES BETWEEN"
30220 PRINT"■■■■■■■■■■■■■■■■■■■■■■ERASE AND DRAW MODES."
30230 PRINT"■ ■MOVE PEN■ -        ALLOWS YOU TO MOVE"
30240 PRINT"■■■■■■■■■■■■■■■■■■■■■■THE PEN WITHOUT"
30250 PRINT"■■■■■■■■■■■■■■■■■■■■■■DRAWING."
30260 PRINT"■ ■DROP PEN■ -        ALLOWS YOU TO START"
30270 PRINT"■■■■■■■■■■■■■■■■■■■■■■DRAWING AGAIN."
30280 PRINT"■ ■ESCAPE SELECT■ -   ALLOWS YOU ESCAPE"
30290 PRINT"■■■■■■■■■■■■■■■■■■■■■■FROM SELECT MODE"
30295 PRINT"■■■■■■■■■■■■■■■■■■■■■■IF YOU PRESS THE"
30300 PRINT"■■■■■■■■■■■■■■■■■■■■■■JOYSTICK BUTTON BY"
30305 PRINT"■■■■■■■■■■■■■■■■■■■■■■MISTAKE."
30306 PRINT"■ ■NEW SPRITE■ -      CLEARS THE SPRITE"
30307 PRINT"■■■■■■■■■■■■■■■■■■■■■■AND ALLOWS YOU"
30308 PRINT"■■■■■■■■■■■■■■■■■■■■■■TO REREAD THE"
30309 PRINT"■■■■■■■■■■■■■■■■■■■■■■INSTRUCTIONS."
30310 GOSUB40000
30320 PRINT"■■ ■SELECT MODE■ -    ON THE RIGHT HAND SIDE"
30330 PRINT"■■■■■■■■■■■■■■■■■■■■■■OF THE SCREEN ARE THE"
30340 PRINT"■■■■■■■■■■■■■■■■■■■■■■COMMANDS THAT ARE"
30350 PRINT"■■■■■■■■■■■■■■■■■■■■■■AVAILABLE TO YOU."
30360 PRINT"■■■■■■■■■■■■■■■■■■■■■■TO ENTER SELECT"
30370 PRINT"■■■■■■■■■■■■■■■■■■■■■■MODE SIMPLY PRESS THE"
30380 PRINT"■■■■■■■■■■■■■■■■■■■■■■JOYSTICK BUTTON AND"
30390 PRINT"■■■■■■■■■■■■■■■■■■■■■■MOVE THE ARROW TO"
```


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PROGRAMS

```
30400 PRINT"■■■■■■■■■■■■■■■■■■■■THE COMMAND THAT YOU"
30410 PRINT"■■■■■■■■■■■■■■■■■■■■WISH TO USE THEN"
30420 PRINT"■■■■■■■■■■■■■■■■■■■■RELEASE THE BUTTON."
30430 PRINT"■■ ■NOTE■ - THE JOYSTICK MUST BE IN PORT 2"
30500 GOSUB40000
30510 GOTO65
39999 REM ** HIT ANY KEY **
40000 PRINT"■                ■HIT ANY KEY"
40005 GETA1$:IFA1$=""THEN40005
40010 RETURN
```

Spectrum Blaster

by Alan Green

Well, yes, it is another space-invader type game, but it has redeeming features. Like the fact that it demonstrates many of the special features of the Spectrum, including colour (BRIGHT, FLASH, INVERSE, etc), sound (ok, bleep) and user-defined graphics. And anyway, *I* happen to *like* zapping bug-eyed monsters.

The program runs on both 16 and 48k machines and contains full instructions: the usual 'blast the aliens before they kill your grandmother and eat your pet dog' (or visa versa, of course). Please note that the 'A', 'B' & 'C' in lines 40, 50 & 60 respectively should be entered as graphics A, B & C. The same applies to 'B' and 'C' in line 487. Thanks to Neil Marshall for the modifications in lines 212 and 214.

```
  5 GO SUB 320
  10 REM ...Alien Blaster...
  20 REM ...c Alan Green ...
  30 REM ...    1982     ...
  40 FOR n=0 TO 7: READ j: POKE
USR "A"+n,j:NEXT n
  50 FOR n=0 TO 7: READ k: POKE
USR "B"+n,k:NEXT n
  60 for n=0 TO 7: READ l: POKE
USR "C"+n,l:NEXT n
  70 LET a=10: LET s=0: LET q=1
  80 LET z=31: LET y=120
  90 PRINT AT 12,4;"Do you want
instructions"
  95 BEEP .1,20: LET a$=INKEY$:
IF a$="y" THEN GO TO 380
  96 IF a$="n" THEN GO TO 100
  97 IF a$="" THEN GO TO 95
  100 BORDER 1: PAPER 1: INK 6: C
LS
  110 PRINT AT 1,0; BRIGHT 1; INK
  3;"
----";AT 19,0; INK 6;"----------
----------"
  120 PRINT AT 0,2; BRIGHT 1; INK
  5;"Score 0";AT 0,16; BRIGHT 1;
INK 5;"High ";ss
  150 LET c=INT (RND*30)+1: LET b
=3
  152 IF c<=5 THEN LET w=2000
  153 IF c>5 AND c<26 THEN LET w=
3000
  154 IF c>=26 THEN LET w=1000
  155 LET ch=INT (RND*2)+1
  160 PRINT AT 18,a; INK 6;" A ";
AT b-1,c-1;"   ";AT b,c; INK 4;C
HR$ (ch+144)
  170 LET x=(a*8)+12
  180 LET a=a+(INKEY$="2" AND a<=
28)-(INKEY$="1" AND a>=1)
  190 PLOT x,z: PLOT OVER 1;x,z
  200 IF INKEY$="0" THEN DRAW INK
  5;0,y: BEEP .025,20: PLOT x,z:
DRAW OVER 1;0,y: GO TO 260
  205 GO SUB w
  210 LET b=b+1: BEEP .01,19-b: I
F b=19 THEN GO TO 230
  212 PRINT AT 18,a; INK 6;" A "
  214 LET a=a+(INKEY$="2" AND a<=
28)-(INKEY$="1" AND a>=1)
  220 GO TO 160
  230 BEEP .5,-20
  240 PRINT AT 18,c-1;"   ": PRIN
T AT 21,q*2; INK 7;CHR$ (ch+144)
: IF q=5 THEN GO TO 300
  250 LET q=q+1: GO TO 150
  260 IF x=(c*8)+4 THEN GO TO 280
  270 GO TO 205
  280 FOR n=-3 TO -1: PRINT AT b,
c; INK 1; INVERSE 1;CHR$ (ch+144
): BEEP .04,5-n: PRINT AT b,c; I
NK 2;CHR$ (ch+144): BEEP .04,n:
NEXT n
  290 LET s=s+(b+(ch*2)): PRINT A
T 0,8; BRIGHT 1; INK 5;s: PRINT
AT b,c;" ": GO TO 150
  300 PRINT AT 10,12; INK 7;"Game
 Over": IF s>=ss THEN LET ss=s:
PRINT AT 0,21; BRIGHT 1; INK 5;s
s
  305 GO SUB 600
  310 PRINT AT 12,6; INK 6;"Press
 Y to play again"
  320 IF INKEY$="y" THEN CLS : BE
EP .3,30: GO TO 70
  330 IF INKEY$="n" THEN CLS : ST
OP
  340 GO TO 320
  350 DATA BIN 00000000,BIN 00011
000,BIN 00011000,BIN 10011001,BI
N 10011001,BIN 11111111,BIN 1000
0001,BIN 10000001
  360 DATA BIN 00111100,BIN 01111
110,BIN 11011011,BIN 01111110,BI
N 01011010,BIN 10000001,BIN 0100
0010,BIN 00100100
  370 DATA BIN 00111100,BIN 00100
100,BIN 00111100,BIN 01111110,BI
N 11111111,BIN 00100100,BIN 0100
0010,BIN 10000001
  380 BORDER 2: PAPER 2: INK 7: C
LS
  390 PRINT "ALIEN BLASTER": PRIN
T AT 0,0; OVER 1;"------------"
  400 PRINT AT 2,0;"The Aliens ar
e invading your ";AT 4,1;"system
,your only hope is to";AT 6,1;"b
last them before they land";AT 8
,1;"and colonise the earth !"
  410 PRINT AT 10,1; INVERSE 1; I
NK 7; FLASH 1;"WARNING..."
  420 PRINT AT 12,1;"ONLY FIVE AL
IENS HAVE TO LAND";AT 14,1;"TO T
AKE OVER !!!"
  430 PRINT AT 21,1;"Press any ke
y for next page"
  440 BEEP .1,16: BEEP .1,21 : IF
 INKEY$="" THEN GO TO 440
  450 CLS
  455 PRINT "ALIEN BLASTER": PRIN
T AT 0,0; OVER 1;"------------"
  460 PRINT AT 2,0;"To move base
right press ";INVERSE 1;"2"
  470 PRINT AT 4,0;"To move base
```


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PROGRAMS

```
left press ";INVERSE 1;"X"
 480 PRINT AT 6,0;"Press "; INVE
RSE 1;"X"; INVERSE 0;" to fire
": PRINT AT 9,0;"There are two d
ifferent aliens, one scores more
 than the other."
 485 PRINT AT 12,0;"The aliens a
re worth more the  nearer they
are to the planet."
 487 PRINT AT 15,5; INK 5;"B...R
aider": PRINT AT 17,5; INK 4;"C.
..Droid"
 490 PRINT AT 21,1;"Press any ke
y to start"
 500 BEEP .2,5: IF INKEY$<>"" TH
EN GO TO 100
 510 GO TO 500
 520 BORDER 2: PAPER 2: INK 7: C
LS
```

```
 530 PRINT AT 10,9;"Alien Blaste
r"
 540 FOR n=-10 TO 40
 550 BEEP .1,40-n
 560 NEXT n: PAUSE 2: BEEP .5,20
: BEEP 1,15: RETURN
 600 FOR n=0 TO 2: BEEP .1,10: B
EEP .1,15: NEXT n
 610 FOR n=20 TO 0 STEP -2
 620 BEEP .1,n: NEXT n
 630 PAUSE 3: BEEP .25,15: BEEP
.25,15
 640 RETURN
1000 LET c=c-1: RETURN
2000 LET c=c+1: RETURN
3000 RETURN
```

ACCOUNTANCY AID

continued from page 197

The alternative, then, is to separate each day's processing and to enter the routine, introduce the entries for the day's bankings and then exit the routine. A disadvantage here is that you will probably get a form feed and have a separate sheet for each single day's banking transactions, and that adds up to a lot of paper at the end of the month.

Sadly, most of the suites that I have seen do not allow a sub-total of each day's transactions.

General

One of my personal hates is piles of stationery, and systems which insist upon keeping you hanging around while the printer trundles out the items that you have just entered. In my opinion, this defeats the whole object of efficient use of the machine itself. There are better ways of handling the situation such as entering the transaction into a temporary transactions file which is directed to the printer only when the contents of that file are posted into the ledger system. Some packages actually do this. Indeed, if the system is fast enough and you have an external large capacity printer buffer, you might well find your computer is held up by a transmission of data to your printer for seconds in the hour rather than a large number of minutes.

In reviewing accounting software over the last few years, I have compiled a series of notes which eventually found their way into a questionnaire and this questionnaire gets updated from time to time. Within the last four months I have sent it to a number of software vendors.

Pegasus answered it in full. TABS and Compact didn't reply. ACC banned me from demonstrations of Pulsar by its dealers on the grounds that I was dealing in a rival machine (it could be true).

Microshade – which was only available on CPM-80 machines when I tested it – did, as I mentioned above, include a cash book and also had a delightful standing order handling routine although the suite had other drawbacks. The company did respond to my various criticisms and it appears that the update of their suite (then being tested) incorporated some substantial improvements, and I look forward to seeing the new version.

For the last eighteen months I have actually been using an American version of the Peachtree software, which was written some three years ago. It has proved very reliable. Indeed, we haven't had one single error, but in many respects – probably because of its age and origins – it is very primitive. I feel sure that the Peachtree software available today will be much more sophisticated, although I have not actually tested it. Two years ago I saw Graffcom software and at the time I rejected it on the grounds that certain reports could only be received if they were printed rather than be seen on the screen, and I regarded this as time consuming and wasteful. Naturally, two years is quite a long time and things may have changed. END

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SPECTRUM PLUS

continued from page 147

all at different memory locations and are designed to slot in with whatever other parts of the system are being utilised. The other parts include Sofmon — a comprehensive and easy to use disassembler/monitor — a graphics kit and a programmer's toolkit.

Softime is unique in that it offers a digital clock with alarm and stopwatch facilities that can be left on display while entering or running a program. It is fairly accurate in normal operation but is adversely affected by SAVE, LOAD or BEEP. But the real value of Softime is the fact that it gives nine function keys —seven of which may be defined by the user with up to 100 bytes of Basic. These keys are accessed by using the SPACE key as a third shift key — holding down SPACE and key 0 allows you to define/edit/inspect each of the digit keys. Key 1 is set to RANDOMIZE USR 49152 to use Super C; key 6 toggles the clock on and off screen; key 8 allows you to set 'ON ERROR' to whatever takes your fancy, and key 9 does the same for 'ON BREAK'. The other keys can be given any function you desire — the only restriction is that the code for each key must be 100 bytes or less. You can, of course, change the functions on keys 1 and 6 if you wish. You have the choice of defining a key with code that is executed immediately (as in RAND USR 49152) or with Basic that is brought down in editing mode. This is done by putting REM after the definition — thus to access the toolkit you would define, say, key 3 as RAND USR 63488: REM . If you now press SPACE and 3 the line is brought down and you simply tack the toolkit function on the end before pressing ENTER to execute it.

I was not over-impressed with Softek's compiler, which seemed to me to be overpriced in comparison with its rivals. With Softime, though, I think the Softek programmers have excelled themselves — as far as I know it is the first implementation of function keys on the Spectrum and it certainly makes using the compiler, toolkit or assembler very easy. Highly recommended at £8.99.

LEISURE LINES

by J J Clessa

Quickie

A rope ladder hangs down the side of a ship. The rungs on the ladder are one foot apart. At low tide the water just covers the bottom rung. At high tide the water level goes up by 3 feet. How many rungs will be covered then? The answer is *not* 4.

Prize Puzzle

In my house there are many cats. Seven of my cats won't eat fish, six of them won't eat liver, and five won't eat chicken. Four of them eat neither fish nor liver. Three of them eat neither fish nor chicken and two of them will eat neither liver nor chicken. One of them will eat neither fish, liver nor chicken, and none of them will eat all three foods.

How many cats have I got?

MARCH PRIZE PUZZLE

Not a very big response for this puzzle. About 50 replies in all, of which 16 were able to give an *exact* answer to the problem.

Incidentally, about 10 of the replies did not qualify for the prize since they were not on postcards. Please remember postcards (or backs of envelopes) only for your entries.

Several of the correct entries came from overseas but the winner, selected at random, was Mr Martin Brown of Worksop, Notts. Congratulations Mr Brown, your prize is on its way.

Mr Brown's solution was:

X = 5 476 209 930

Y = 20 000

which gives the required value exactly.

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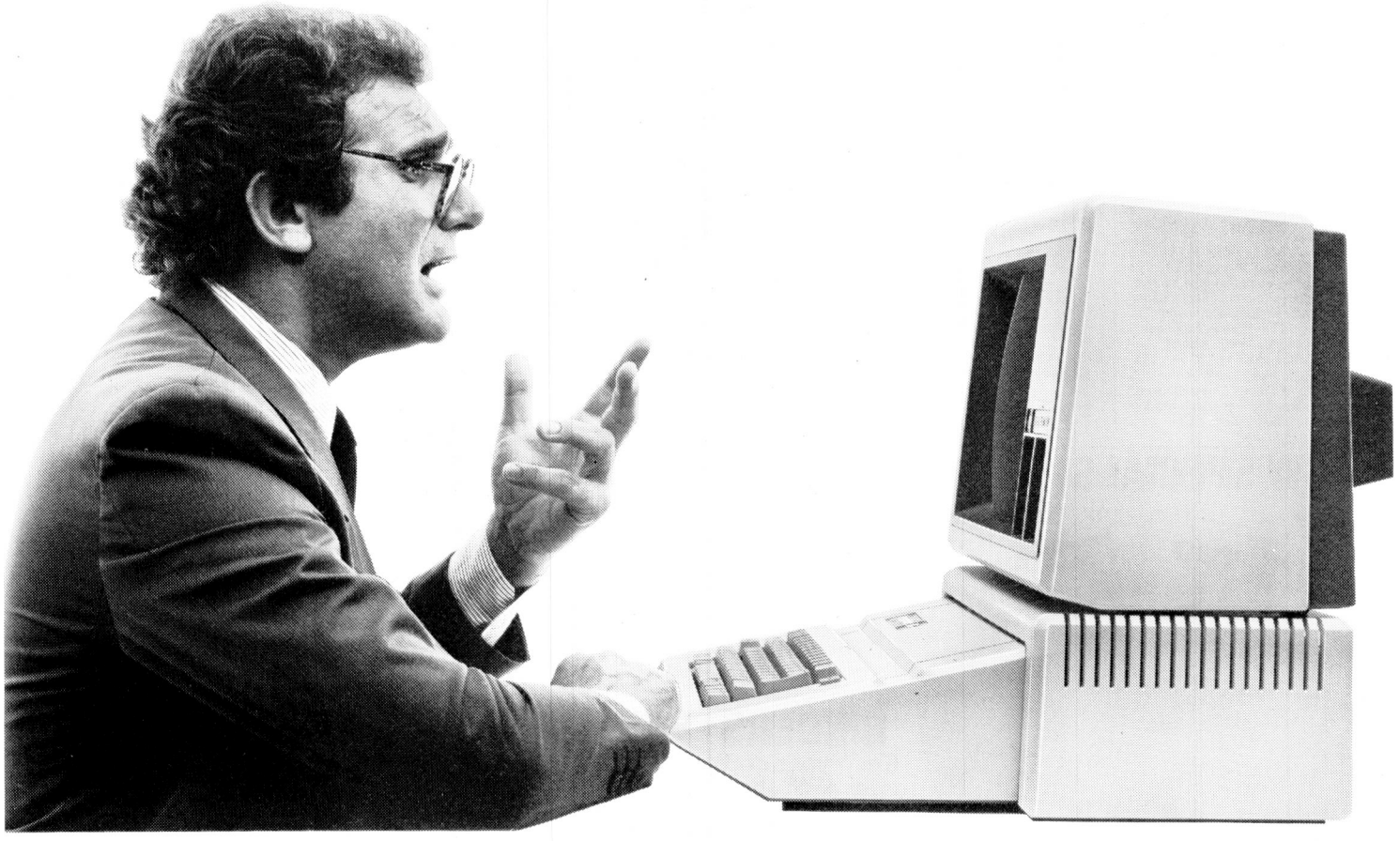

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Volume 1 No 3, 1978
More efficient programs/Cosmac 1802/The PDP11 Part 1/Small busines computing — an approach/ The Z80/EPROM programmer construction.

Volume 3 No 6
June 1980
Benchtest: Tandy TRS-80 Model II/ Benchtest: Sintrom Periflex 630/48/ Staff case study/Checkout: Softy Intelligent EPROM Programmer/ Checkout: Exatron Stringy Floppy/ Practical examples of the IEEEE-48 bus use/Programs: Naming Nascom files/380Z Pictures/Fuel tank calculations — PET/PET large numerals/PET tank battle/Basic string handling.

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

January 1981
Benchtest: Transam Tuscan/Real-time 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.
report/Radio Teletype/WP Benchtest: Wordpro 4 plus/Budget tape interface/Further Casio quirks/ Programs: UK101 Zor, PET



Volume 4 No 6
June 1981
Benchtest: NEC PC-8001/Multi-user Benchtest: MP/M/Benchtest: Sinclair ZX81/West Coast Faire



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.



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.



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 1
January 1982
Benchtests: BBC Micro Xerox 820/Frames of Reference (new series)/ZX81 printer Checkout/ Digital Drummer for PET/Calc Corner: benchmarks/Programs: MZ-80K Fortune, TRS-80 Reaction Timing, ZX80 Laybrinth, Apple Letters.



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 Fire Report/ Lisp/VIC 20 games/Calc Corner: Sharp PC1500/Programs: RML Altered Basic/VIC-20 Large Characters/BBC Breakout/VIC20 Trailblazer/MZ-80K Next-to-Last-One/MZ-80K Tarot.



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July 1982
Benchtests: Mimi 801/Newbrain/ Database Benchtest: Silicon Office/ UCSD p-System/BBC Computer-in-Depth/Apple II games/ Calc Corner: T188/Programs: ZX81 Hypocycloids/BBC Character Generator/TRS-80 Truth/PET Doc/ TRS-80 Screen Dump/UK101 Screen Converter/PET boxes/Atari Earth.



Vol 5 No 8
August 1982
Benchtests: Sort M23/Dragon 32/ Database Benchtest: Cardbox/ Preview: Sony SMC-70/UCSD p-System/RS232 Interface/Sirius graphics/NCC Show report/ZX81 Speech Checkout/Calc Corner: Casio fx602p/Programs: TRS-80 Quadrangle/UK101 Conversion of units/PET Mopup/Apple Lifespan/ Apple Trees/Nascom Snail Racing/ UK101 Long Multipliction & addition.



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.

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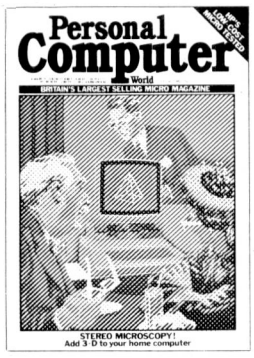
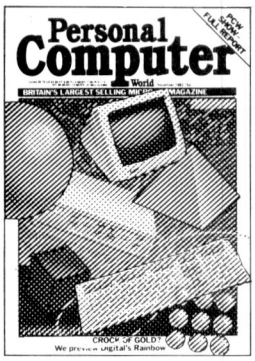


Vol 5 No 10
October 1982
Benchtests: HP-86; Positron 9000/ Database Benchtest; Personal Pearl/ 3D Graphics for BBC Computer/Hashing Techniques/ Designing your own Database/CP/ M-86 v MSDOS/Clock-Calendar Card for Apple II/Calc Corner: hints for Sharp PC122/Programs: ZX81 Star Trek; PET Knockout; PET Trains.



Vol 5 No 11
November 1982
Benchtests: Canon CX-1; Hewlett Packard HP75/Database Benchtest: Condor/Apple II Clock Calendar Card Part — Algebra checking/ Benchmarks summary/Bit Stik graphics for Apple/Calc Corner — HP41C, Casio fx702p programs/ *PCW* Show report/Tiny printing on Centronics 739/Screenplay — Acorn Atom/Programs: Apple Piano; Apple Moon Module; PET Letter-writer; UK101 Logic; Atari Walls; Sharp MZ80K Area-filling; RML 380Z Restore.



Volume 6 No 1
January 1983
Benchtests: Jupiter Ace/Torch/ Database Benchtest: Superfile/ Warnier-Orr programming tecniques/Expert systems/Tokyo Data Show report/Forth Benchmarks/Digital Video/The Nearly Man — Charles Babbage/ Portable Computer World — Continued Fractions/Micro Chess/Screenplay — Spectrum/ Programs: VIC Connect-4/ VICMon/Atari character set mover/VIC UFO/PET Forth Teacher/VIC Doppler/BBC Gomoku.



Volume 6 No 2
February 1983
Benchtest: Sage/Database Benchtest: BusiPost/Which Spreadsheet — new series/Networks — new series/Expert systems/BBC graphics revealed/Logo Turtle/ Micro Chess — Fidelity's Prestige/ Portable Computer World — Sharp PC1251 Benchtested/Numbers Count/Screenplay — BBC games/ Programs — UK101 Vocabulary Test/PET Race Chase II/Apple Character Plotter/Variable Checkchart/ZX81 hex calculator/ Atom Backgammon/Video Genie Aircraft Lander/Atari Flashback/ MZ Text Analysis.



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.

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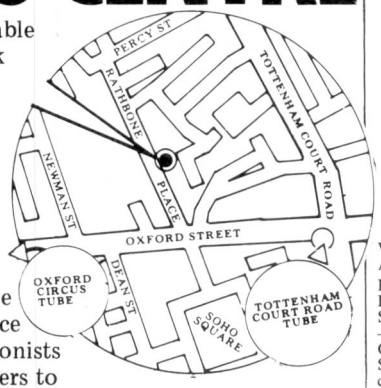



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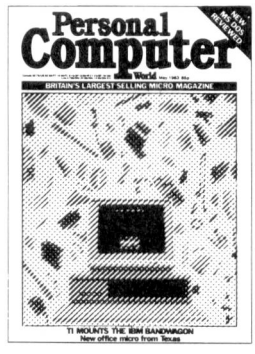

Vol 6 No5
May 1983
Benchtests: Commodore 64, TI Professional/Database Benchtest: MicroPen/Which Spreadsheet? — Plannercalc/Word Processor — MicroScript/Audio training packs/Reliable Code/Centronics Hook-Up/BBC Music/MS-DOS 2/ Lisp/Screenplay — 2X Spectrum/ Portable Computer World — Casio PB100/Chess — Mephisto/ Programs: Oric Bug Eater/Spectrum Big Print/MZ-80k Mole Man/BBC Paintbox/MZ-80k Terrapin/MZ-80k Double Trouble/Tandy Colour Demos.

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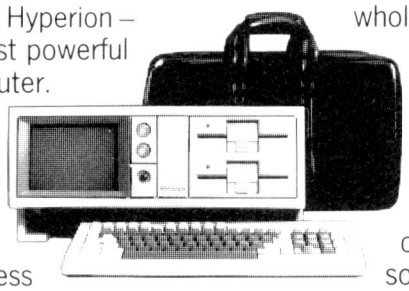

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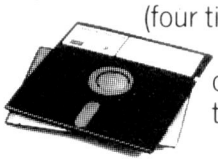

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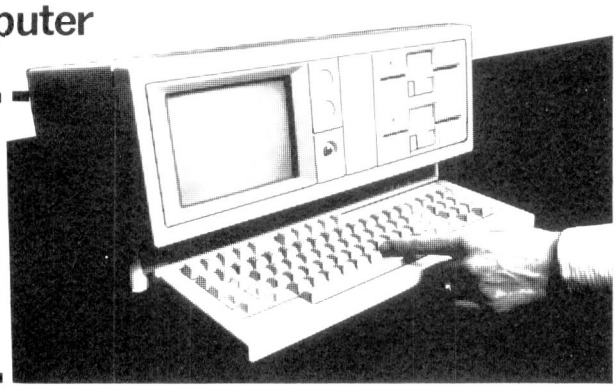

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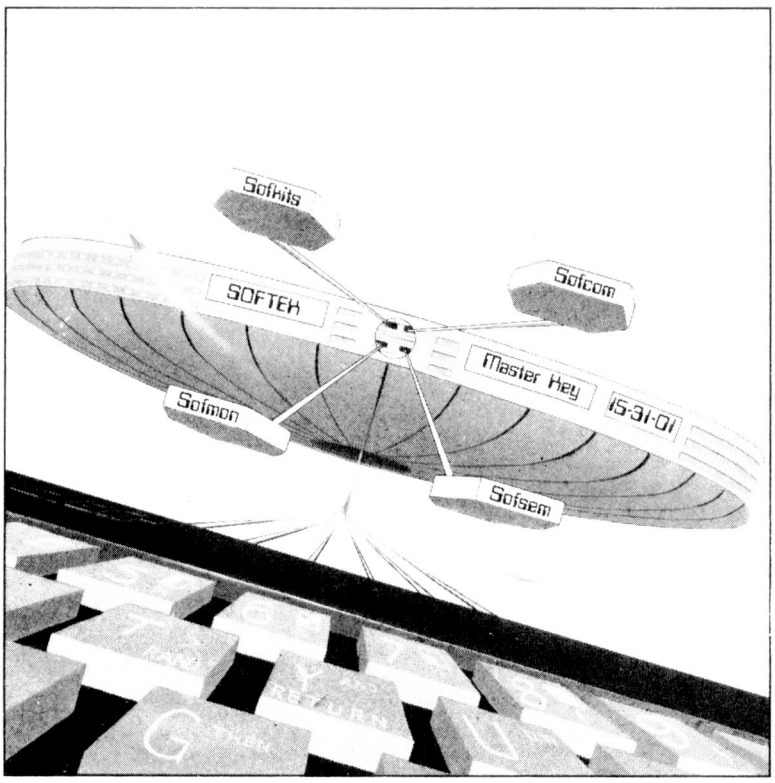

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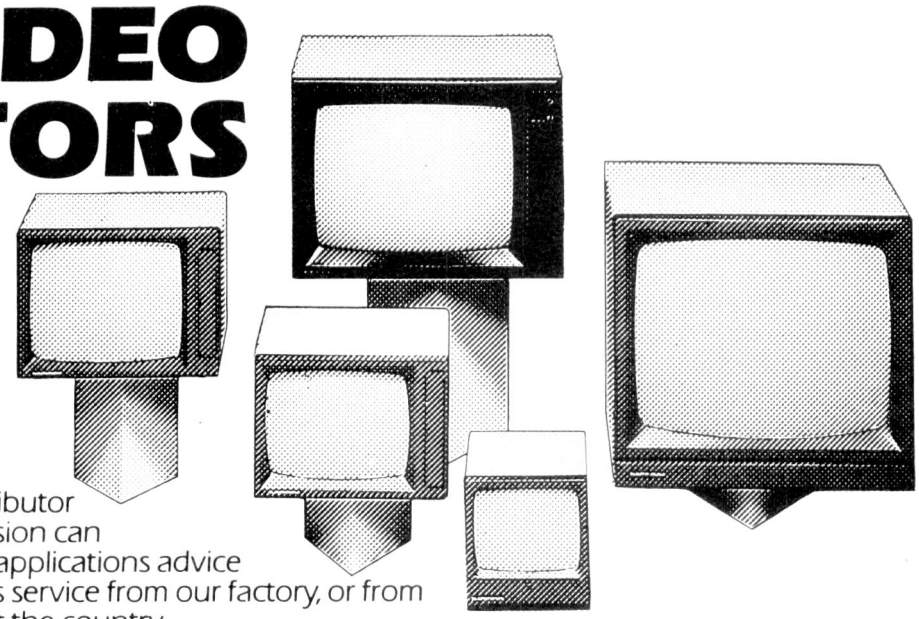

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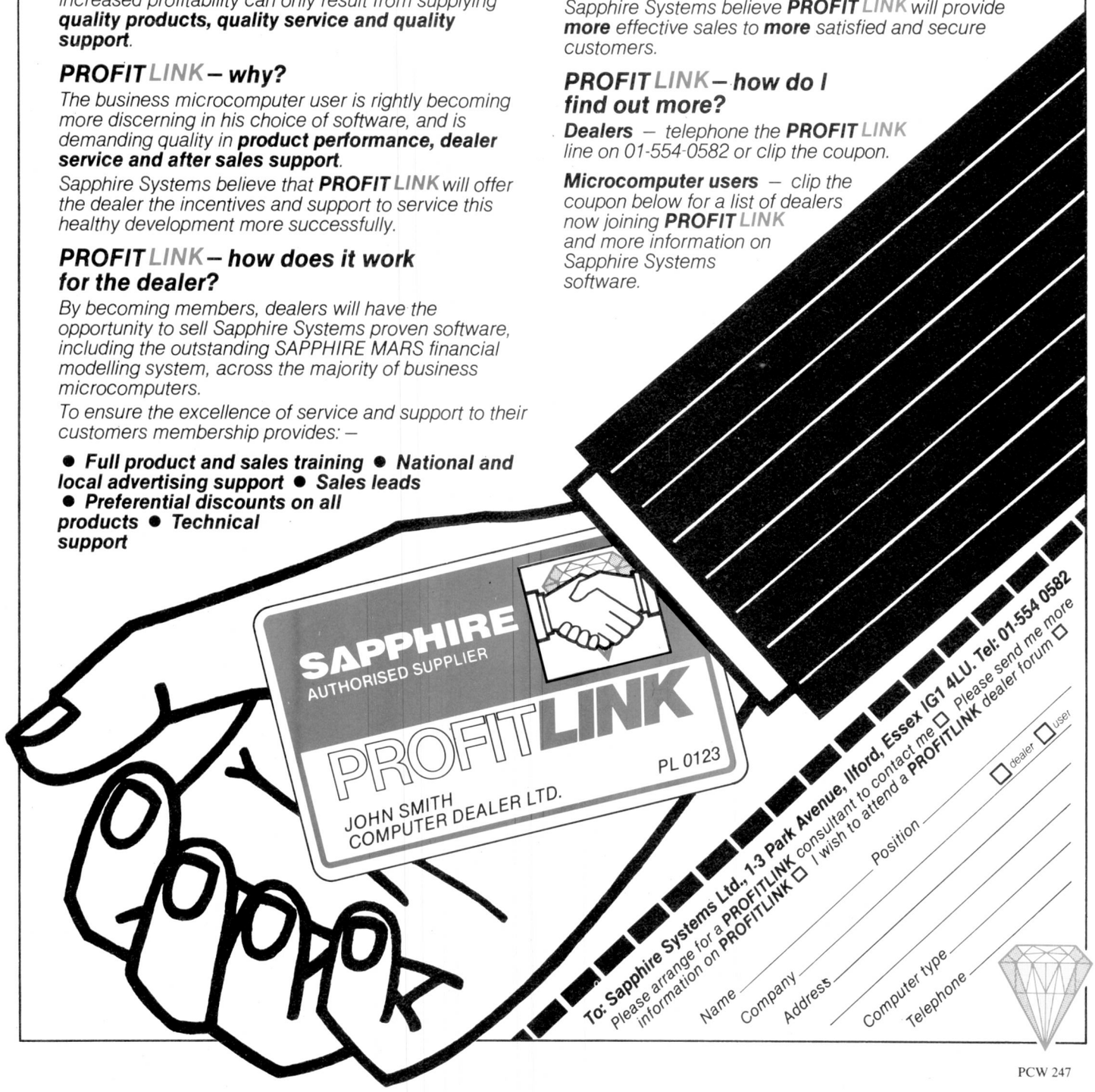

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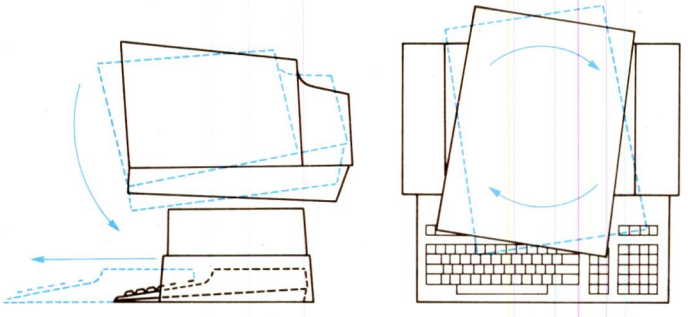



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Profile of the Fourth Generation: TULIP System® I.

Specifications

Computer.	
Processor	8086, 8087 (opt)
Clock	8 Mhz
RAM	128-896 Kb
Serial I/o	RS-232
Parallel I/o	Centronics comp.
Interfaces	Hard-disk, tape, lightpen
Fl. disk controller	8 inch + 5¼ inch
Bufferd Keyboard	104 keys

Storage.	
Floppy disk	dual 5¼ inch; 1.5 Mb
Hard disk – fixed	5 MB, 10 Mb
– removable	5 Mb
Display.	
Formats	80 x 25, 64 x 31, 40 x 25
Low res. graphics	100 x 160
High res. graphics	786 x 288 (opt)
Colour	8
Internat. char. sets	8 – softw. selectable

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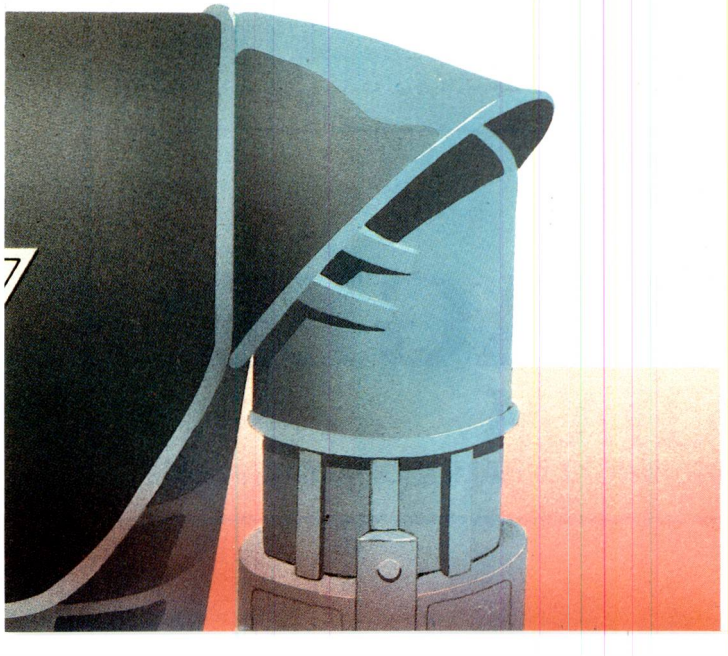

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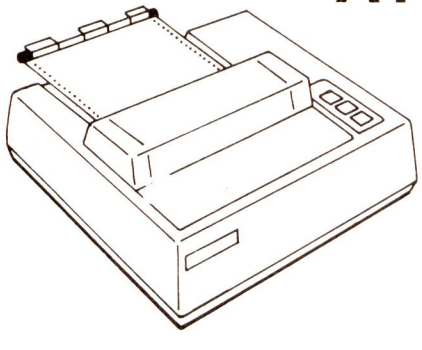

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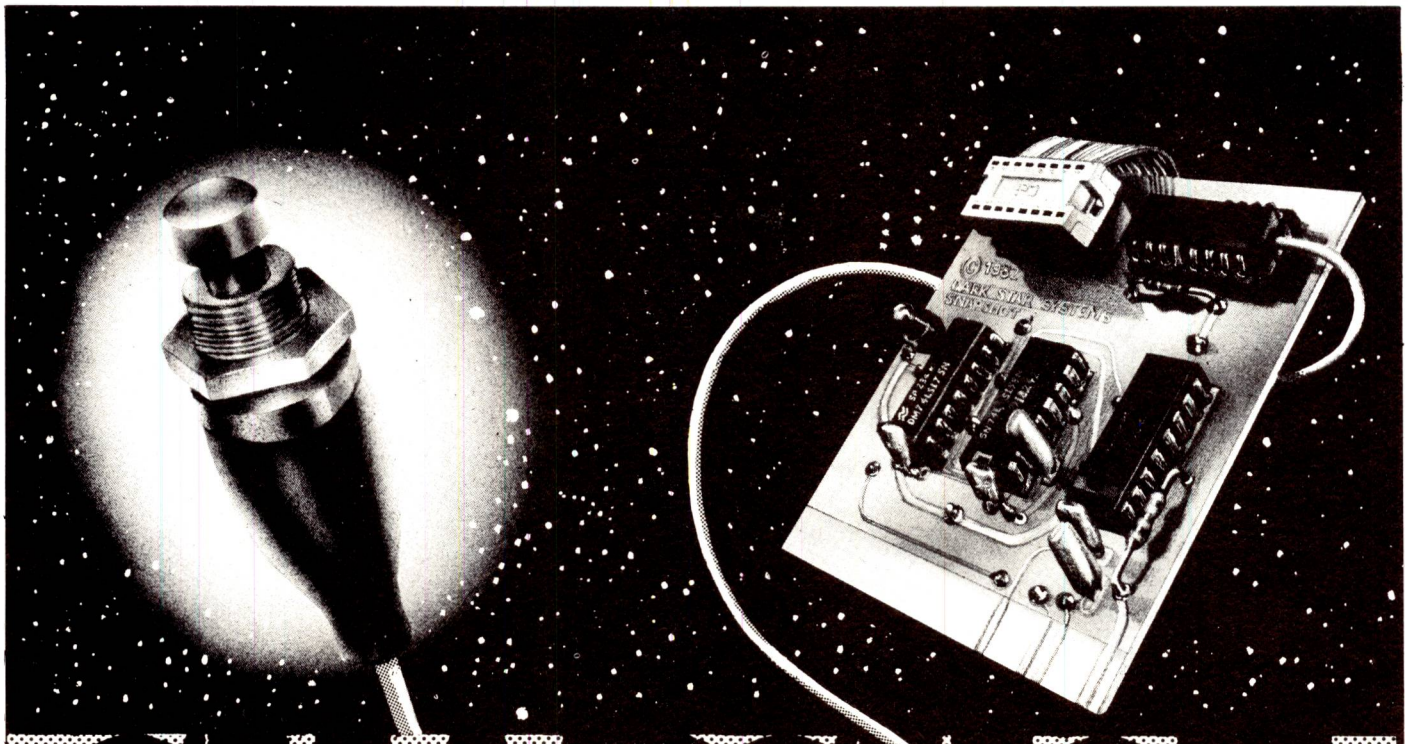

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SNAPSHOT will copy any memory-resident program that runs on the 48K Apple. SNAPSHOT uses your 16K RAM card* to interrupt a running program and dump the entire contents of 48K and registers to an unprotected backup disc. SNAPSHOT backs up programs that baffle nibble copiers like Locksmith without any complex parameter changes or trial-and-error hassle. And SNAPSHOT is still more effective, less expensive and easier to use than its imitators.

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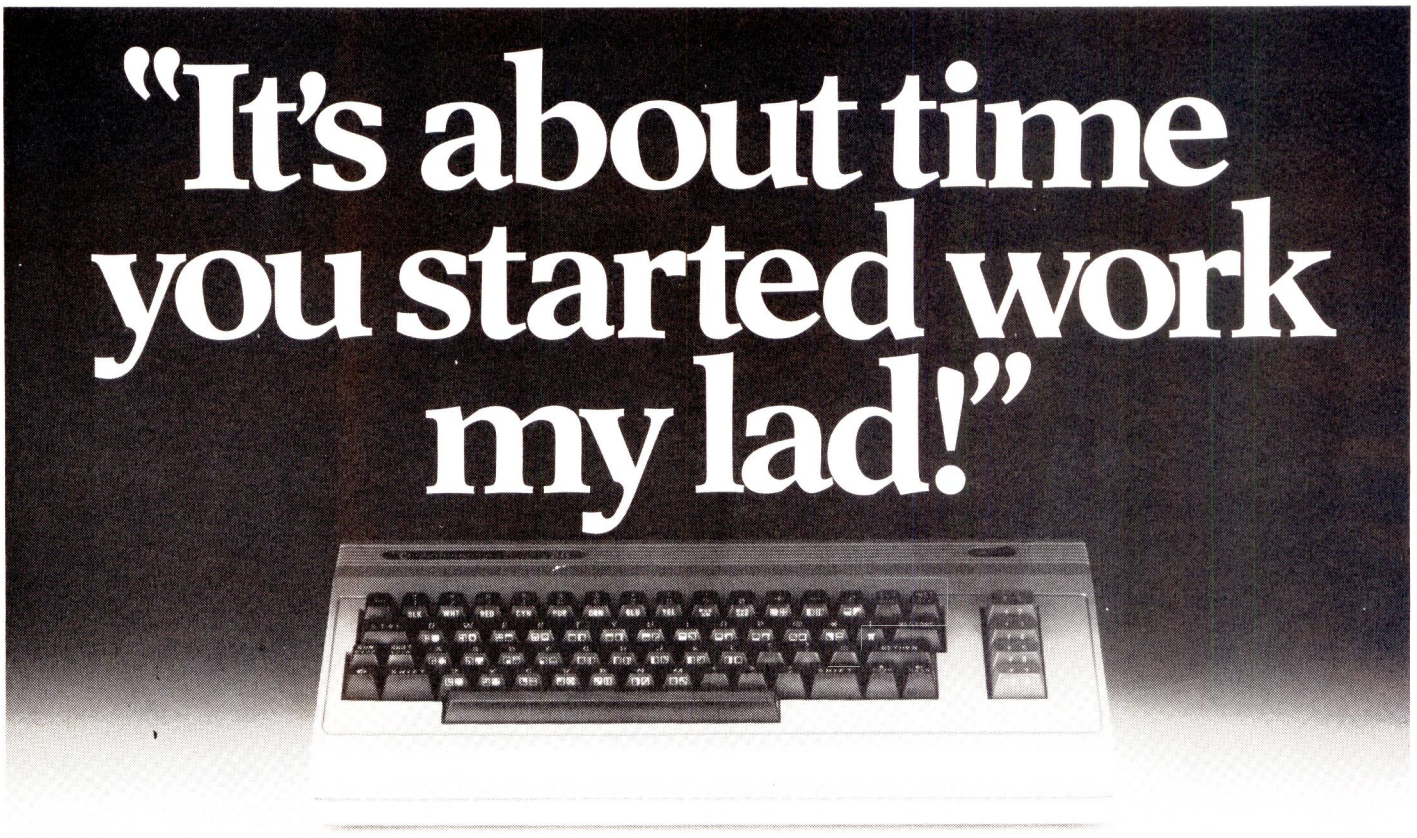

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PCW/6/83

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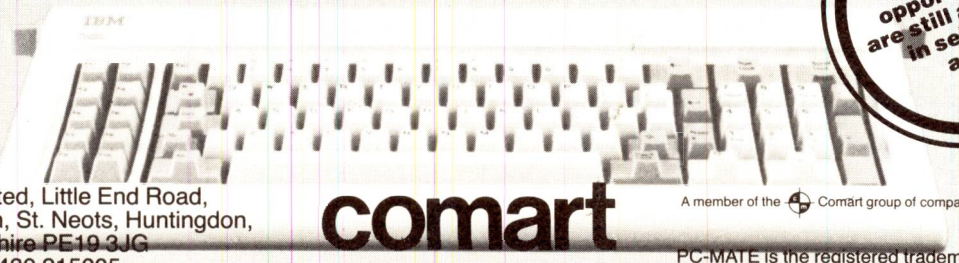

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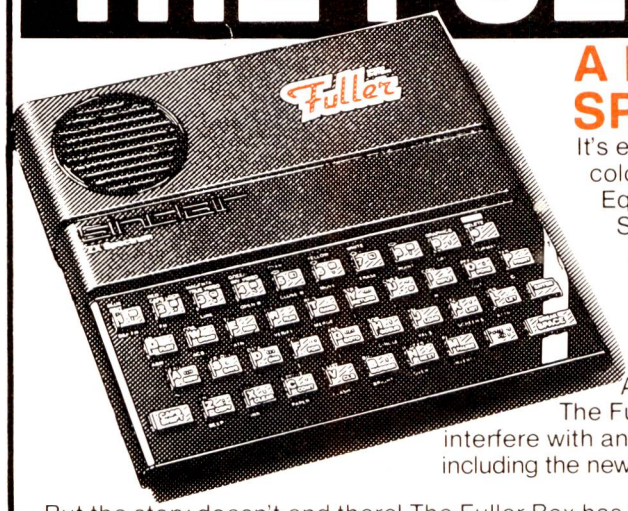

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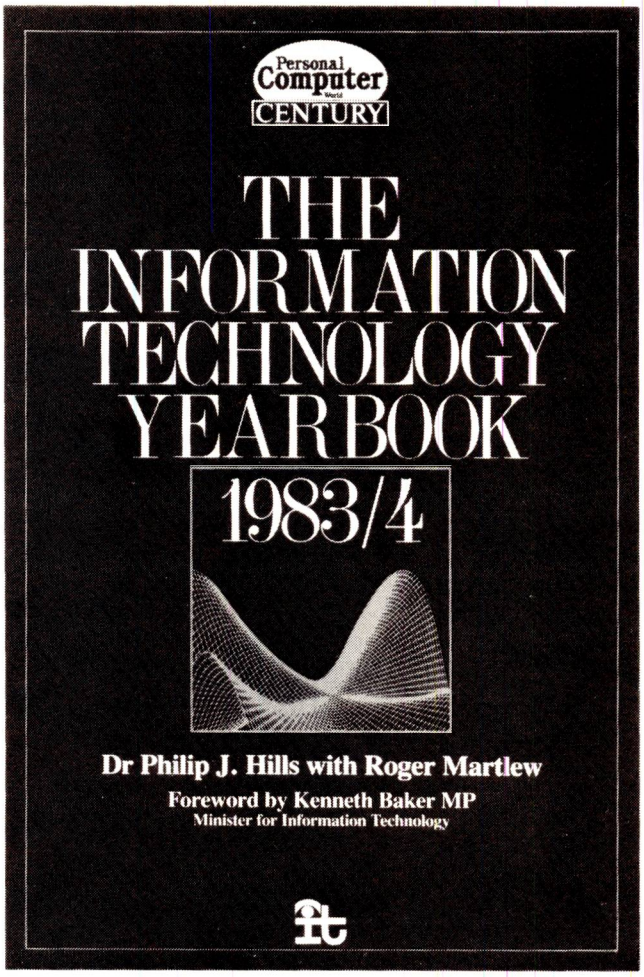

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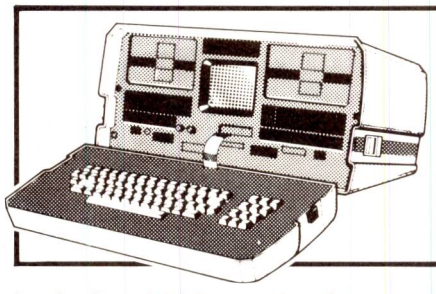

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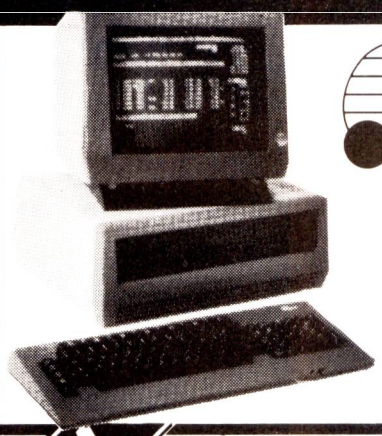

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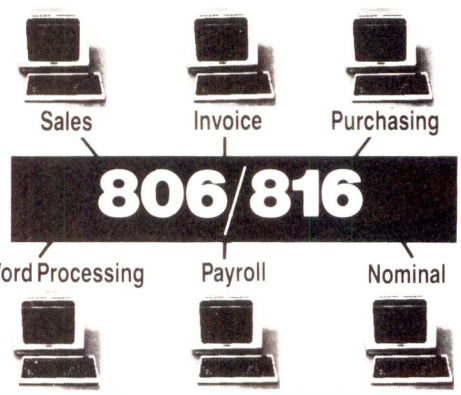

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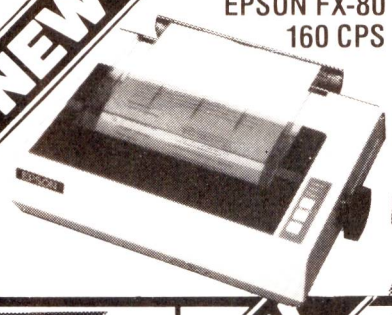

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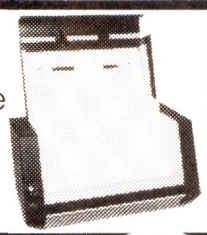

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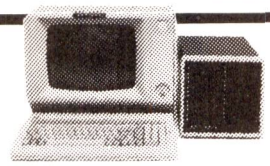

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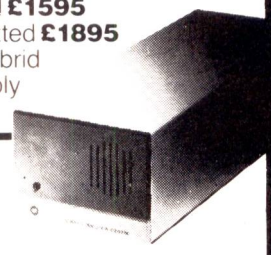

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Critical review?



"The sound commands on the Oric 1 are, for a computer of this price, very sophisticated. Three music channels, and one noise channel, mean that you can program some fairly complex sounds."

POPULAR COMPUTING WEEKLY

"Oric is everything you hoped it would be. Alive with colour, and zapping with built-in sound effects, the Oric looks like a match for any machine now selling for less than £200"

YOUR COMPUTER

"The 16k Oric – fighting the 16k Spectrum – is £25 cheaper. It feels a good deal more 'professional' than the home-appeal Sinclair. Oric's sound is extremely versatile, and well up to the standard of the £300 or £400 BBC microcomputer made by Acorn."

WHICH MICRO?

"Oric was over twice as fast as the Spectrum. Surprisingly perhaps the Oric, which initially seemed only faster when performing the simplest of calculations, has come back to beat the Spectrum by a small amount. As the problems get more complex the Oric comes into its own. One final point – in entering the benchmark tests – the Oric was certainly the easiest to handle."

WHICH MICRO?

"This slope coupled with the design of the keys makes the Oric an easy machine to touch-type on. All keys have auto-repeat and there are four keys dedicated specifically to cursor control. It is certainly easier to type on than any of Sinclair's offerings."

YOUR COMPUTER

"Oric will soon be selling a Modem so that Prestel will become available. Owners will be able to accept telesoftware – programs loaded straight down the phone line – eventually electronic mail could come into the home by the same route, and with the addition of a tape recorder the Oric with its Modem could become a telephone answerer and message taker."

YOUR COMPUTER

"One good feature of the Oric is an on-screen reminder in the top right hand corner to show that you've engaged all-capitals mode. So much better than the BB's variety of lights in the corner of the keyboard. The Oric is sound, simple to get along with and offers great expansion potential."

WHICH MICRO?

"When compared to the stogginess of the Spectrum's keyboard this is certainly an improvement. I can't see any Orics failing through bad assembly. If only the £2400 IBM were so easy to use."

WHICH MICRO?

"Instead of the Spectrum's 28 look-up single-character error reports, the Oric has 18 self-explanatory messages. If you actually want to do computing, rather than just exploring the world of off-the-shelf games programme entertainment the Oric will be a better buy."

WHICH MICRO?

"A good speaker and built-in noises get the Oric's sound off to a good start. Typing Zap, Ping, Shoot or Explode produces convincing arcade game noises which can easily be incorporated into any program."

YOUR COMPUTER

"The modem is certainly unusual in a machine of this price. Together with the other peripherals, when finally available, it should make for an attractive package for a small business... surely a match for machines costing much more"

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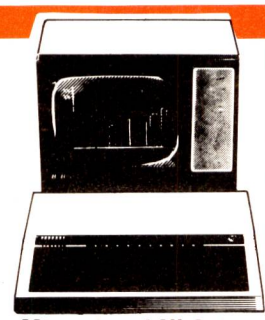

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CP/M v2.2	Digital Research	121				•
CP/M-86	Digital Research	201	•			
CP/Net	Digital Research	149				•
MP/M v2.0	Digital Research	339	*			•

2 High Level Languages

CBasic v2.08	Digital Research	90	*			•
CBasic Compiler	Digital Research	366	***			•
PL/1-80	Digital Research	370	**			•
Forth	MPI Ltd	100				•
CIS Cobol	Micro Focus	425	•		•	•
Level-2 Cobol	Micro Focus	965	•	•	•	•
Coral-66	Micro Focus	825				•
Basic-80 v5.21	Microsoft	241			•	•
Basic Compiler v5.3	Microsoft	272			•	•
Fortran-80 v3.44	Microsoft	344			•	•
Cobol-80 v4.60	Microsoft	516			•	•
muLisp/MuStar v2.12	Microsoft	138				•
muMath/muSimp v2.12	Microsoft	180				•
Pascal MT·	Digital Research	242	*			•
Pascal MT· SPP	Digital Research	173	**			•
Pascal MT· with SPP	Digital Research	346	**			•

3 Low Level Languages

Mac	Digital Research	73				•
Macro-80 v3.44	Microsoft	138				•
Pasm	Phoenix Software Associates	100				•

4 Utilities/System Tools

The Operating Guide	Decision Systems	45				•
BT-80	Digital Research	194				•
Despool	Digital Research	37				•
Sid v1.4	Digital Research	59	*			•
XLT86	Digital Research	111				•
ZSID v1.4	Digital Research	76				•
dUTIL (for DBase-II)	Fox & Geller	76			•	•
Clip	Keele Codes	80	*			•
Spooler	KLH Systems	97				•
CPMSIM	Magic Circle Software	166			*	
Animator	Micro Focus	225	•		•	•
Fileshare	Micro Focus	250				•
FTNUMB	Micrology	50				•
Plink	Phoenix Software Associates	100			*	•
Bug	Phoenix Software Associates	100				•
PDevelop	Phoenix Software Associates	267				•
Plink-2	Phoenix Software Associates	256			•	•
Diskorg	Slogger Software	50				•
Level-2 Animator	Micro Focus	475	•	•	•	•
Diskman	Slogger Software	65				•
Disked-2	Slogger Software	65				•
Disktools-1 (Diskman & Diskorg)	Slogger Software	90				•
Disktools-2 (Disktools-1 & Disked-2)	Slogger Software	145				•

5 Sorting

Supersort	Micropro	145			•	•
Supersort (Apple II)	Micropro	139				•
MSort v1.012	Microsoft	134			•	•

6 Code Generators

The Last One	D.J. 'Al' Systems	330		•	•	•
Quickcode (for DBase-II)	Fox & Geller	215		•	•	•
Quickscreen (for MBasic)	Fox & Geller	121			•	•
Quickscreen (for CBasic)	Fox & Geller	121			•	•
Forms-2	Micro Focus	110	•	•	•	•
Pearl-3	Pearl International	295				•
Autocode	Stemmos	220		•	•	•
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7 Telecommunications/Conversions

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BSTMS	Byrom Software	139				•
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BISYNC-80/3780 (ASCII)	Micro Integration	525				•
BISYNC-80/3270 (BSC)	Micro Integration	525				•
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Reformatter CP/M ⟷ IBM	Microtech Exports	173				•
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Tex v3.0	Digital Research	76				•
Paragrab	Focus	75			•	•
Wordstar	Micropro	295			•	•
Mailmerge	Micropro	145			•	•
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Spellstar	Micropro	145				•
Wordmaster	Micropro	90				•
Wordstar (Apple II)	Micropro	260				•
Mailmerge (Apple II)	Micropro	87				•
Spellstar (Apple II)	Micropro	136				•
Edit-80 v2.02	Microsoft	83				•
Lexicon (Word Analysis)	Microtek	200				•
PEDIT	Phoenix Software Associates	100				•
PMATE	Phoenix Software Associates	139				•

9 Databases/Data Management Systems

dBASE-II	Ashton Tate	438				•
Address Book	Decision Technology	90				•
Rescue	MBS	295				•
Rescue Demonstration System	MBS	35				•
Selector-V	Micro-Ap	380				•
Datastar	Micropro	175				•
Datastar (Apple-II)	Micropro	205				•
Personal Pearl	Pearl International	180				•
Infostar	Micropro	295				•
Address Book Demonstration System	Decision Technology	30				•

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Padmede Business Control System	Padmede Computer Services	1245				•

11 Financial Modelling/Problem Solving

dGraph	Fox & Geller	215			•	•
Mathspack	MPI Ltd	120			•	•
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CDS Versatile 4	Q2
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Comart Communicator CP50	P2
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Comart Communicator CP500	P2
Compal-80	Q2
CPT 8000	A1
Cromemco System 3	A1
Cromemco System 2 SS SD	R6
CSSN Backup	T1
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Delta Systems	A1
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Micropolis Mod II	Q2
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Multi-Tech 1	Q2
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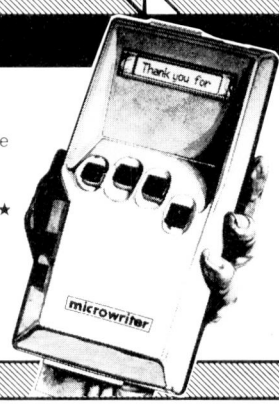

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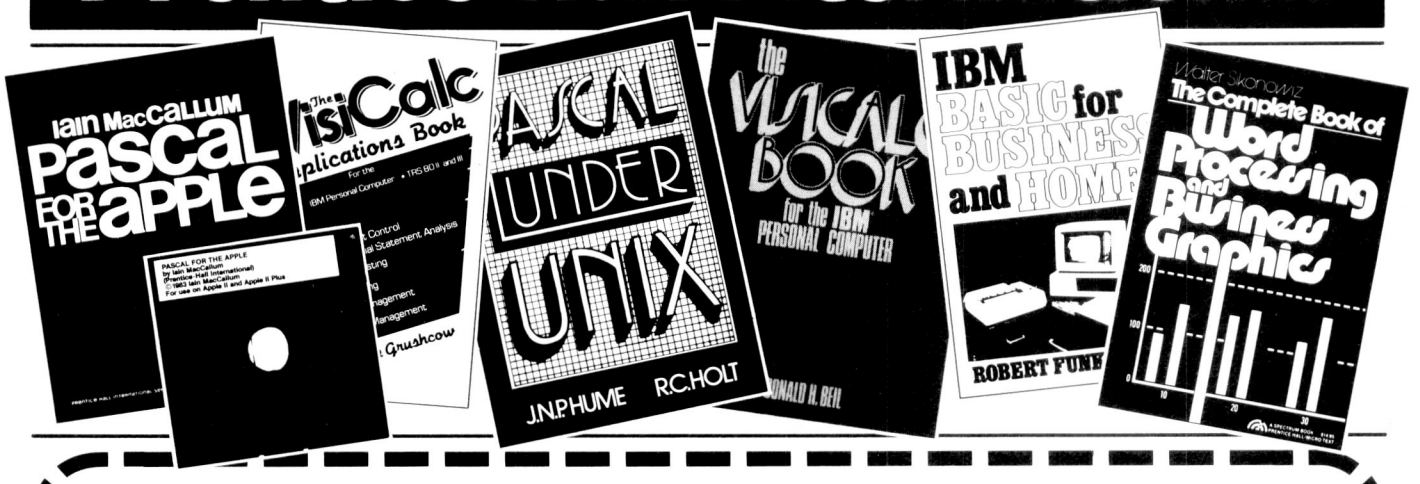

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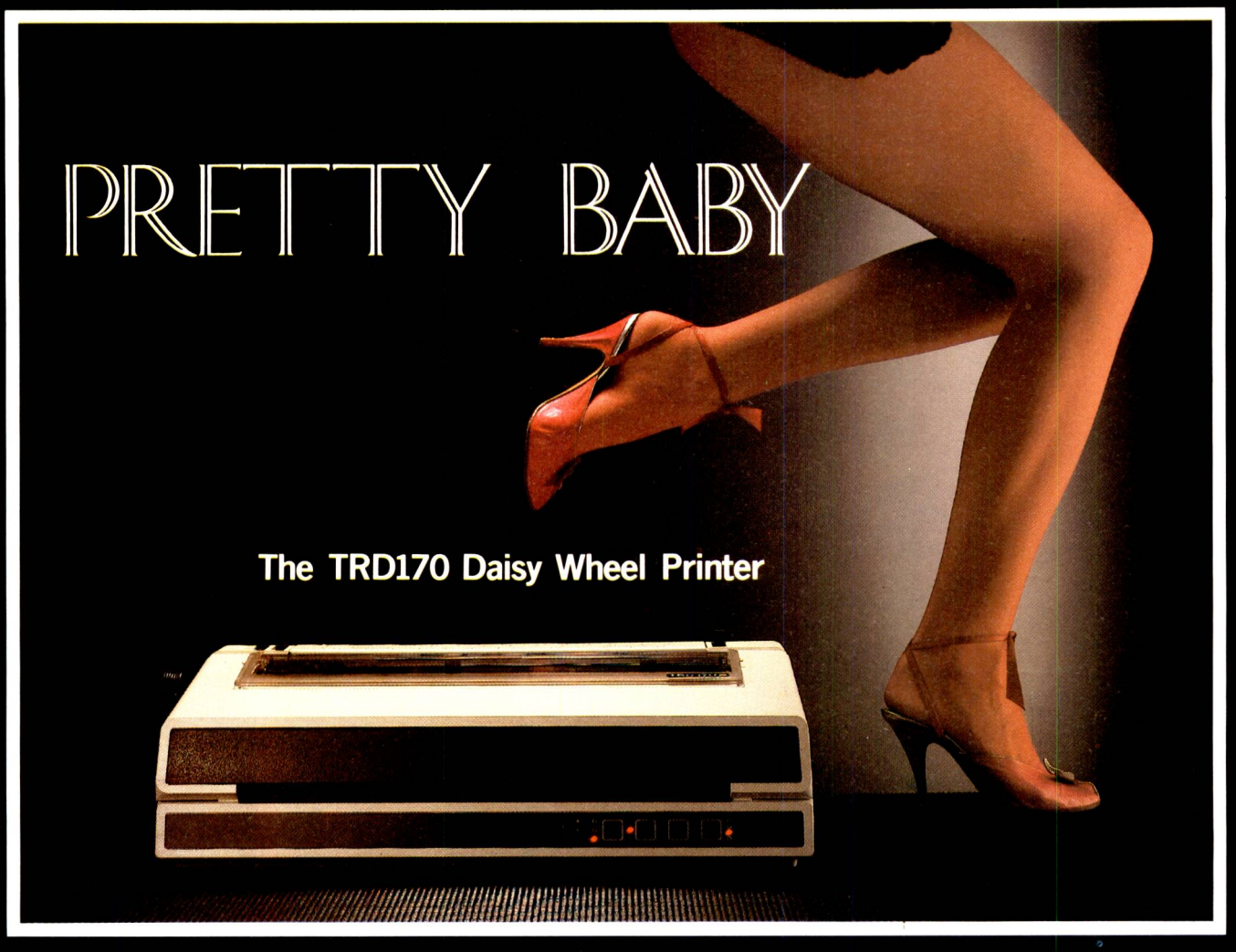

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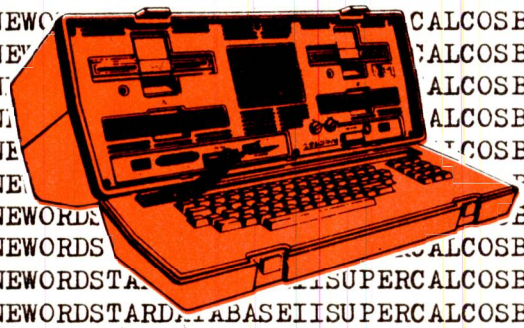

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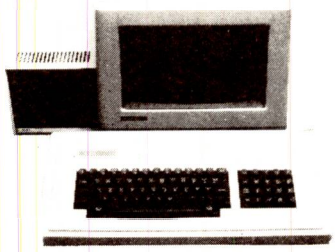

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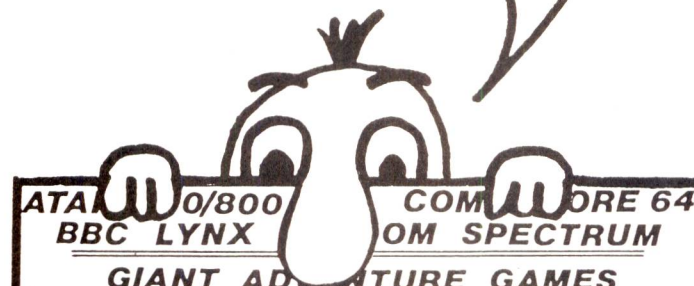

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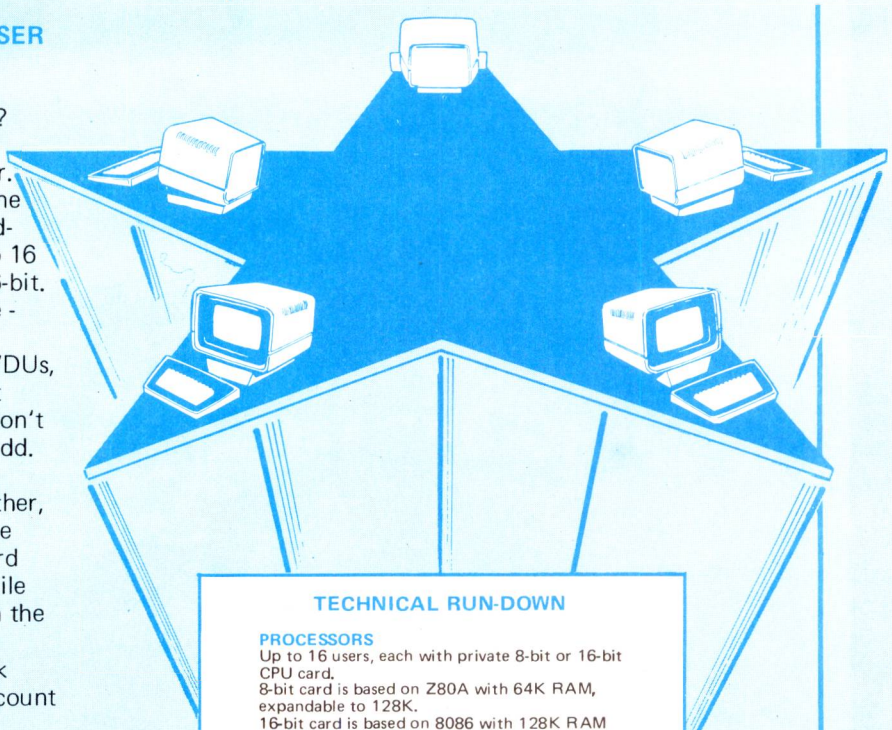

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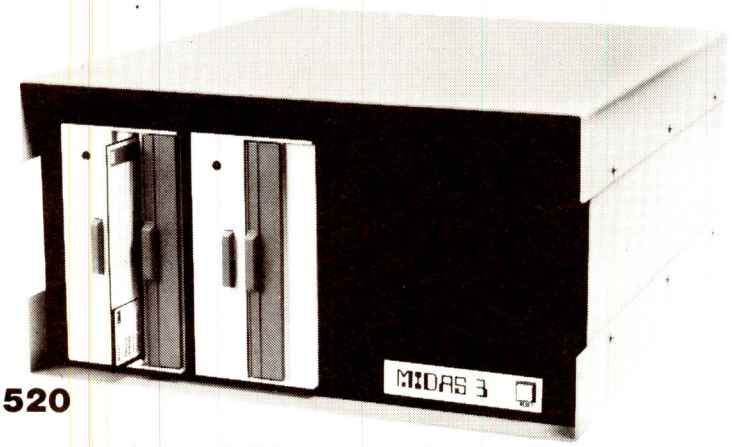

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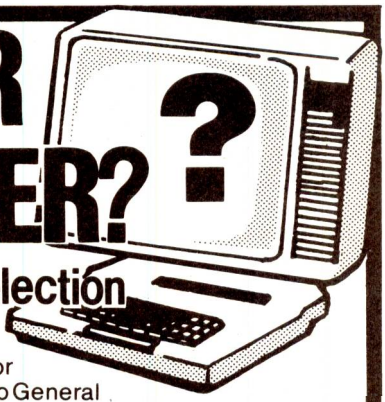

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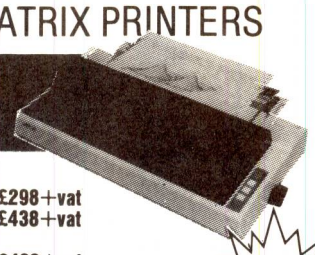

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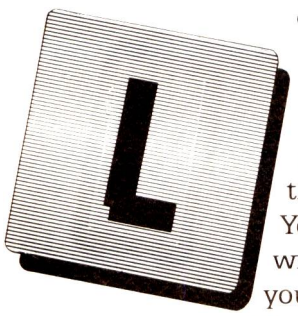

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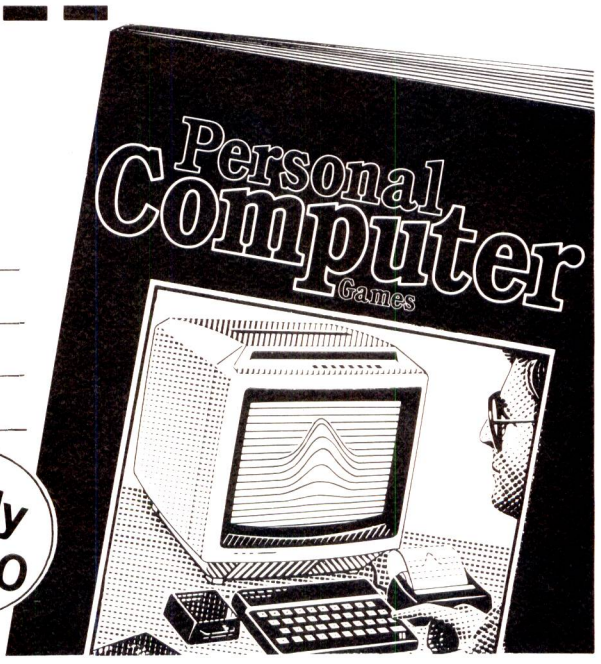

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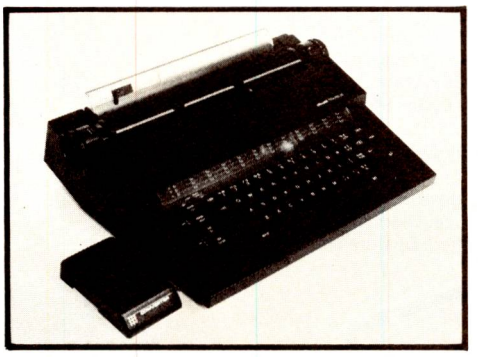

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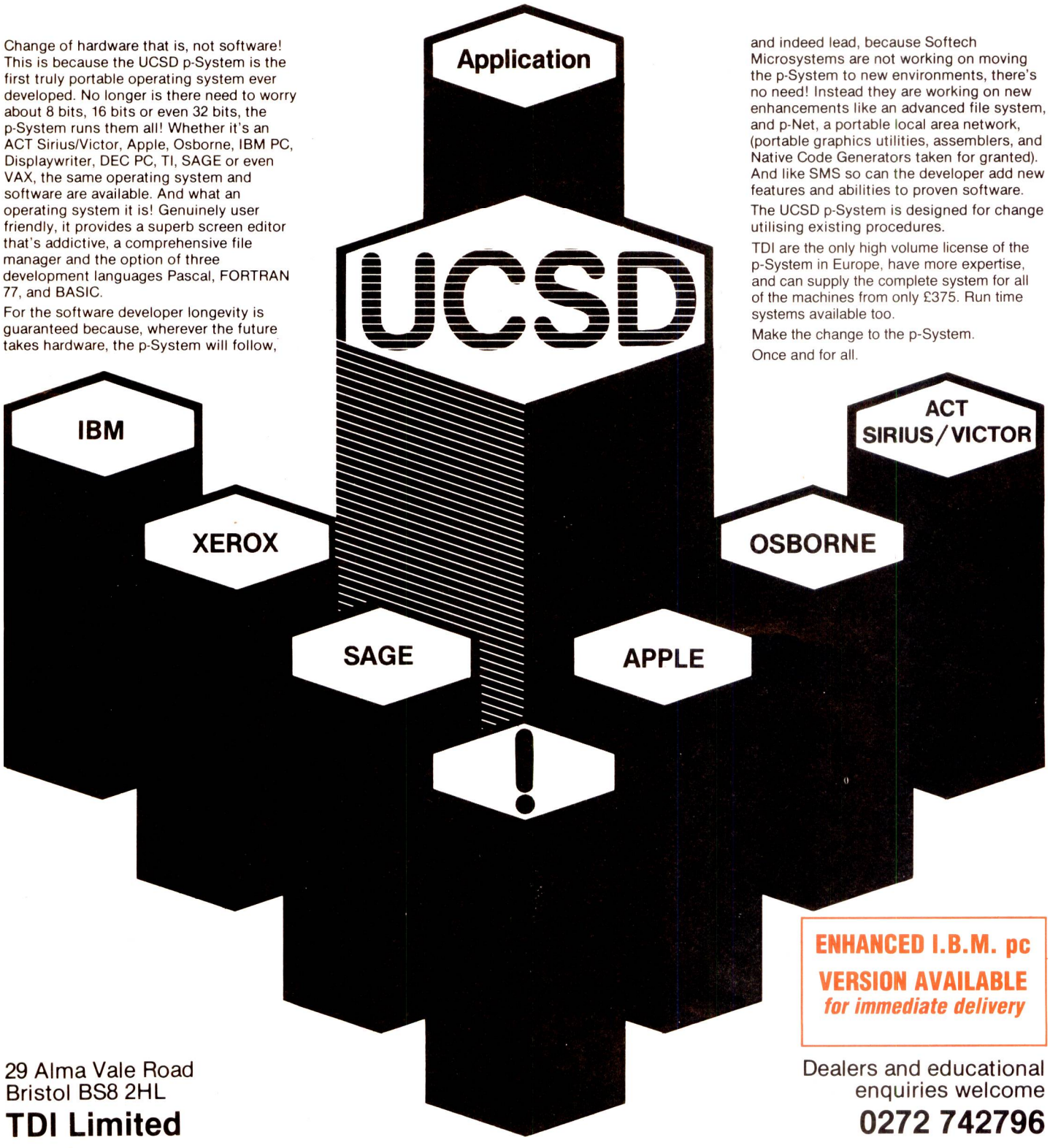

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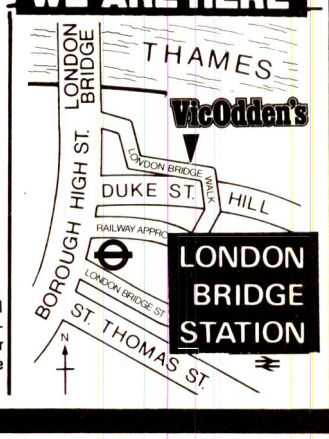

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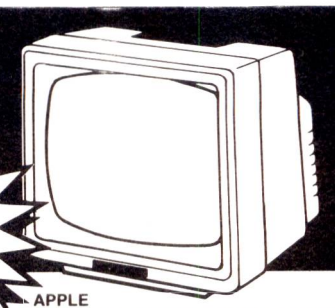

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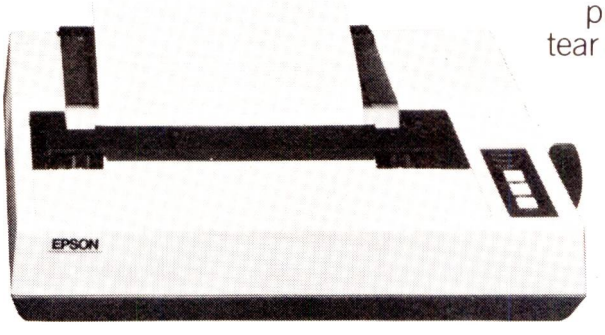

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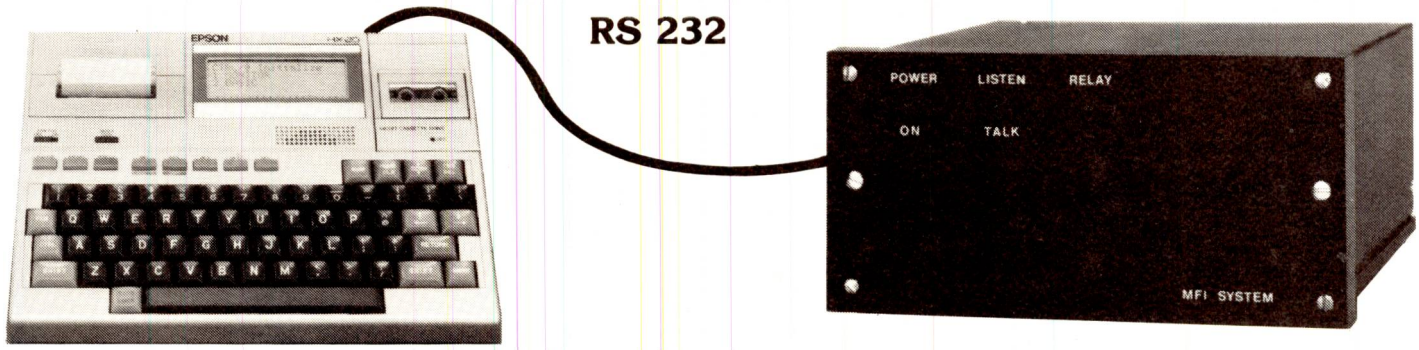

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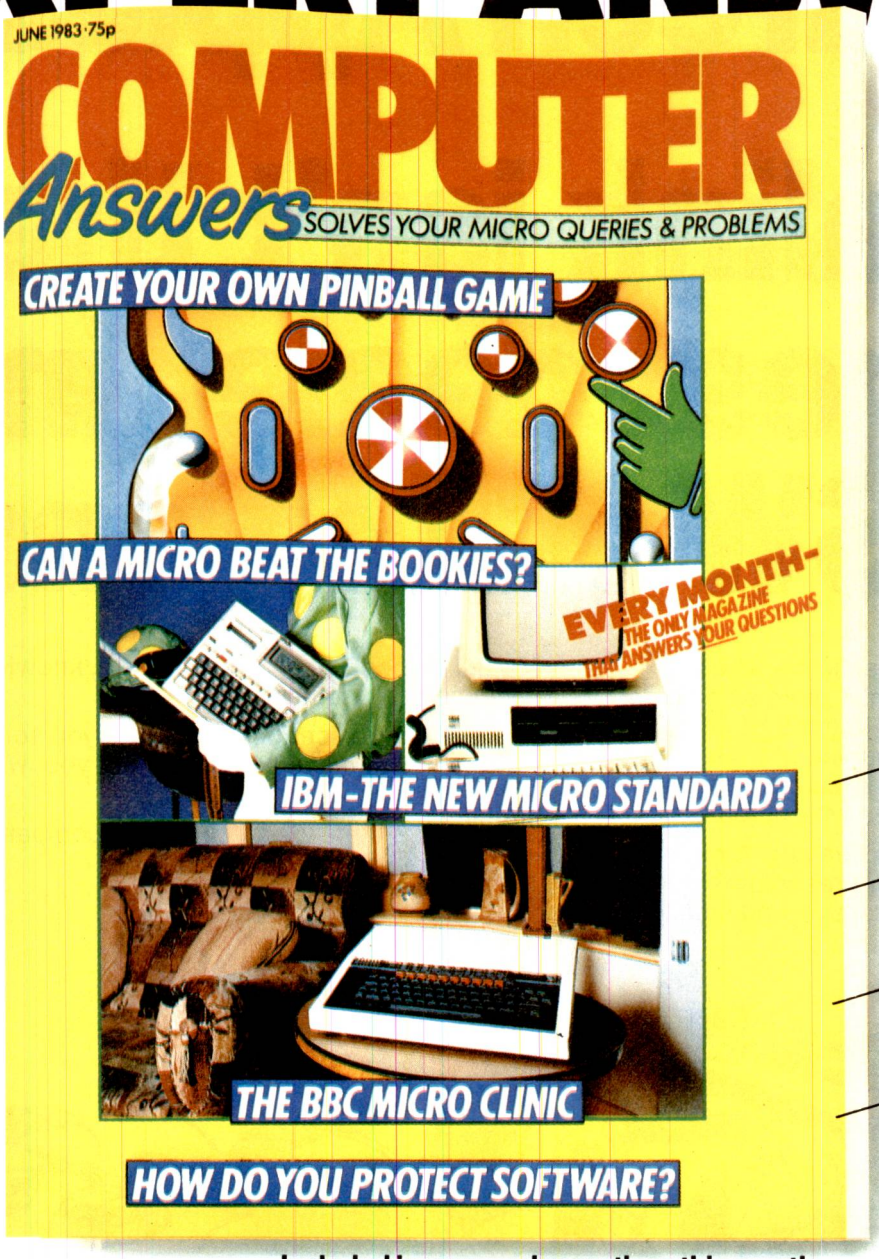

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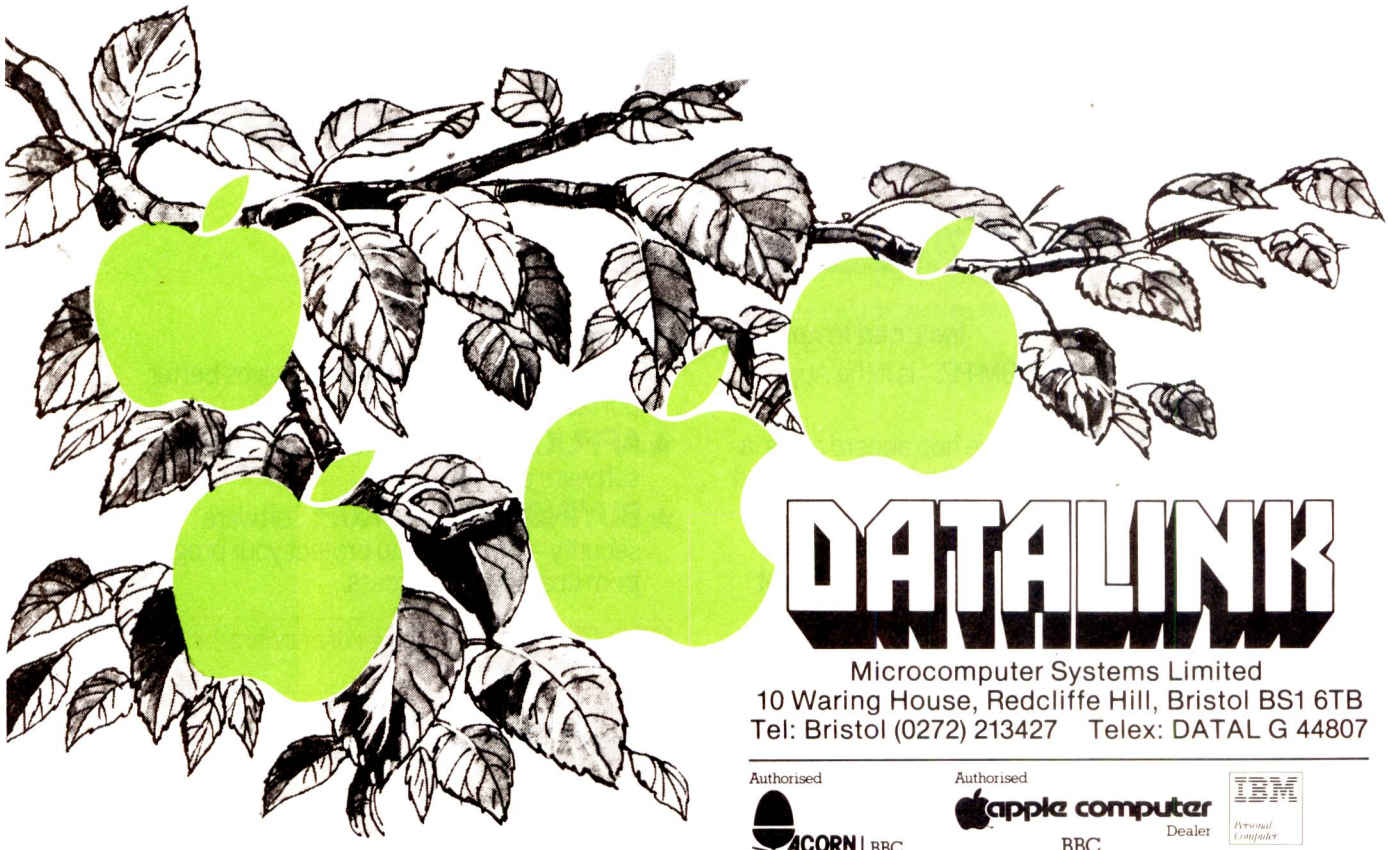

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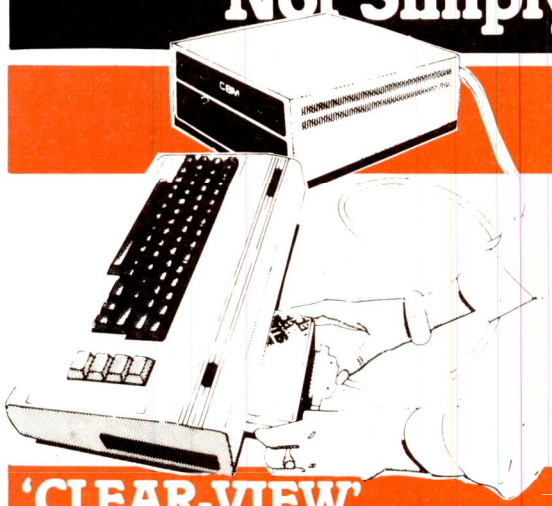

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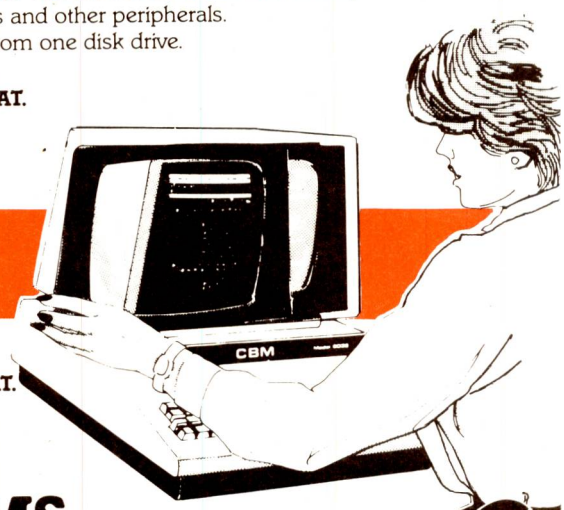

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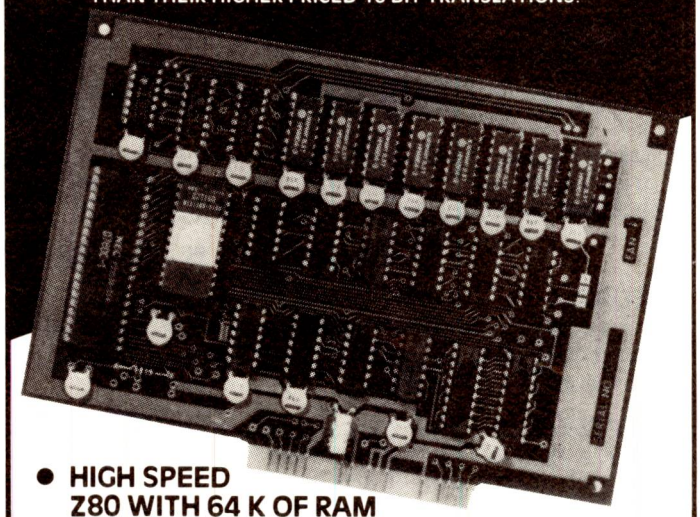

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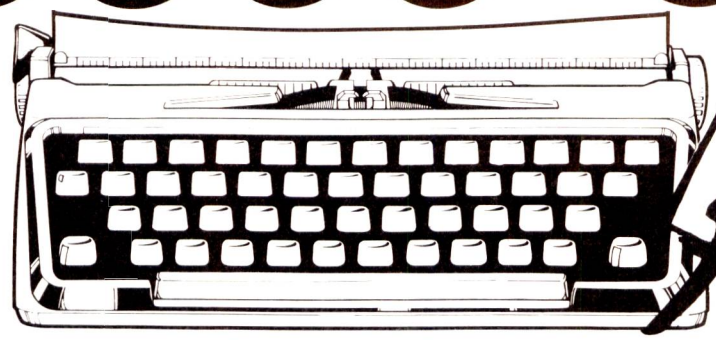

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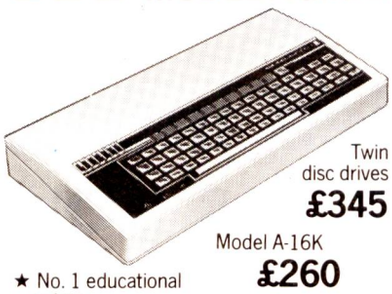

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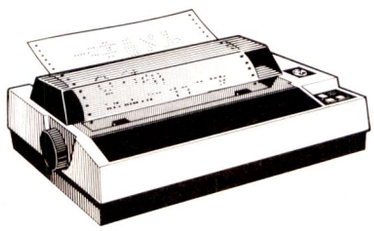

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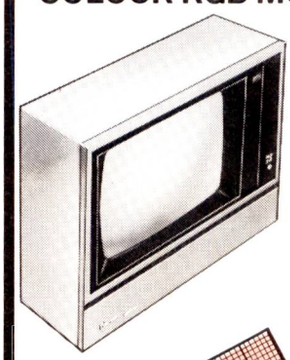

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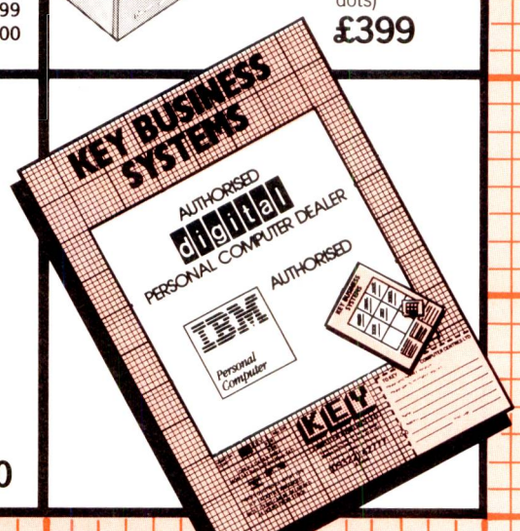

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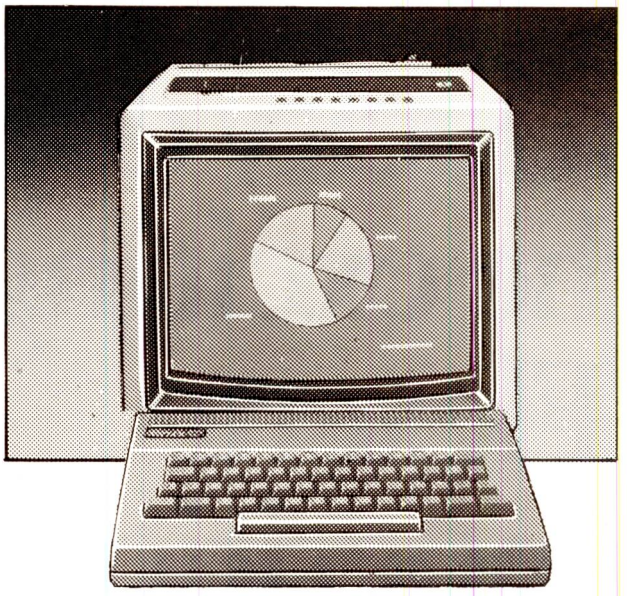

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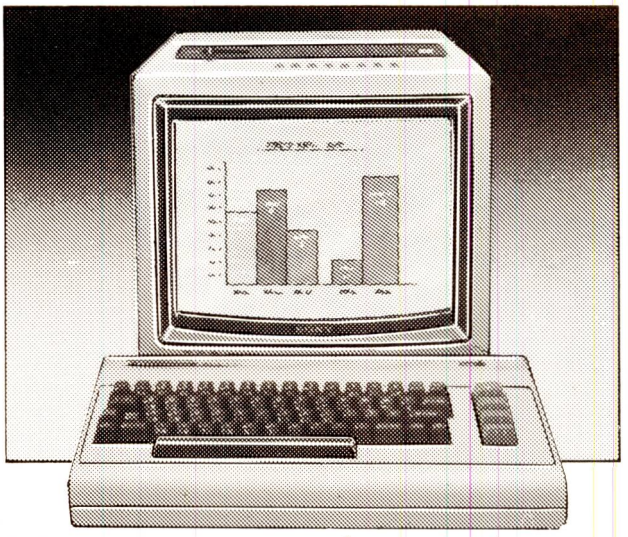

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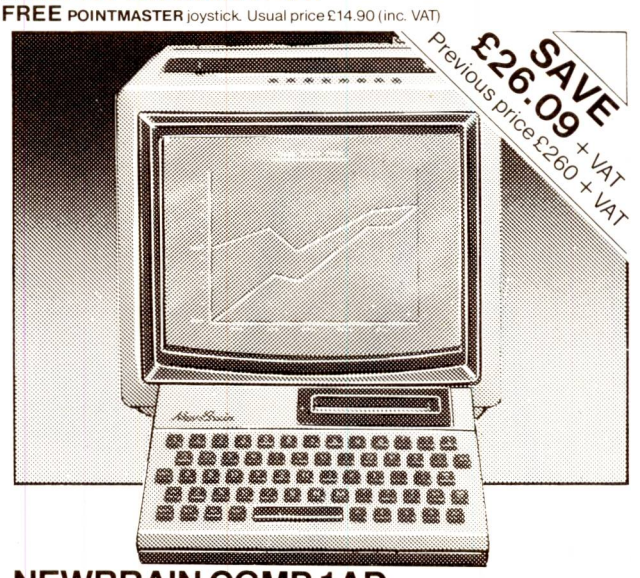

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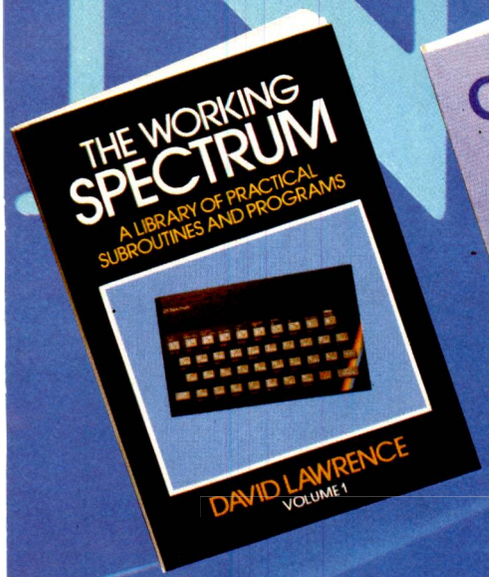

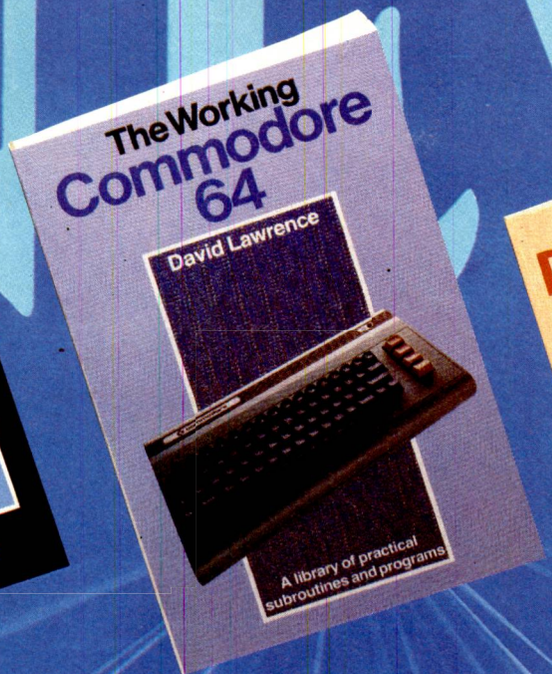

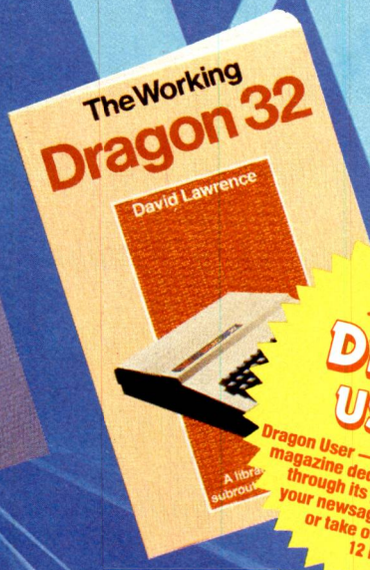

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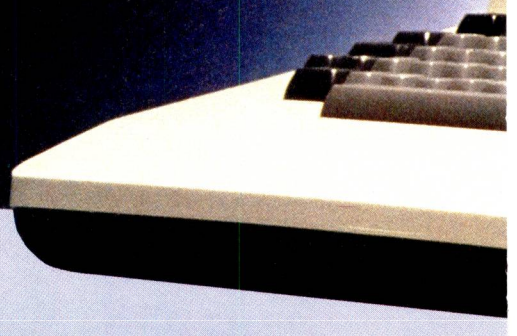

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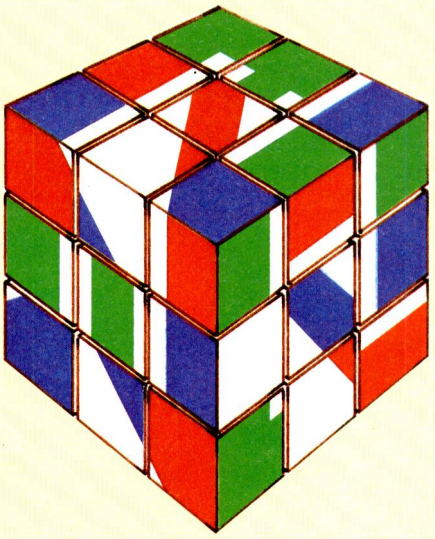

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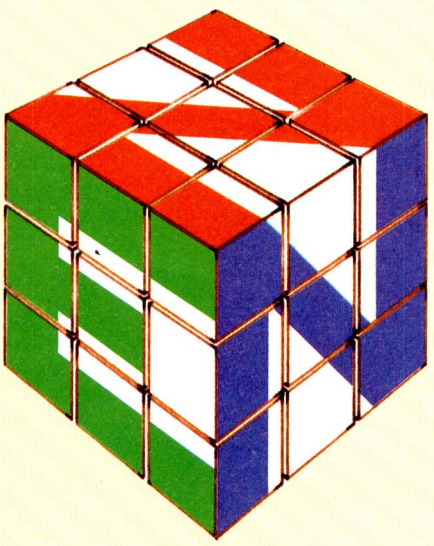

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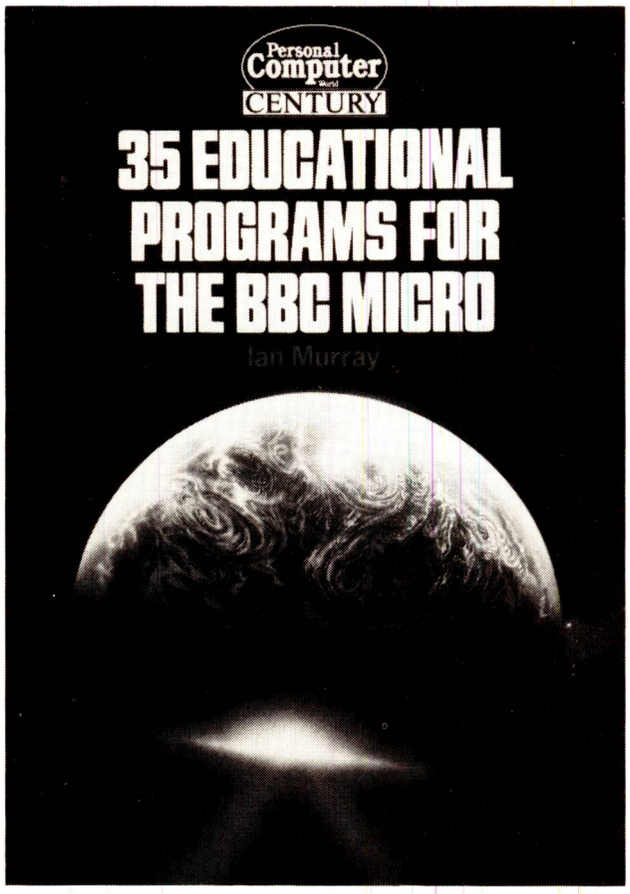

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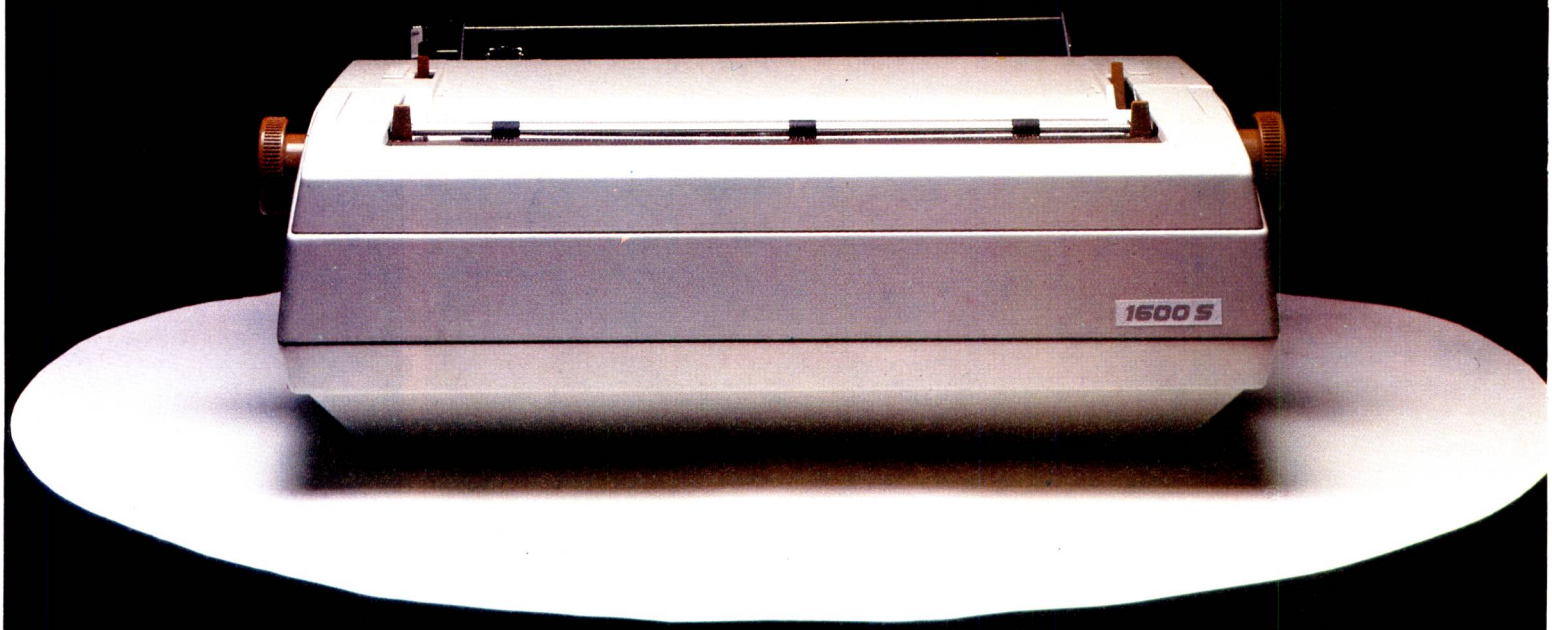

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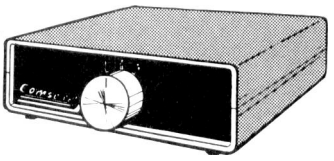

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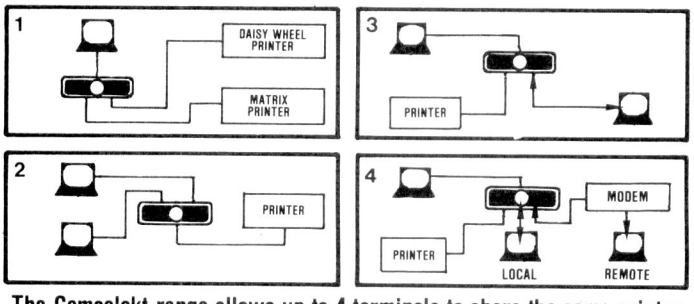

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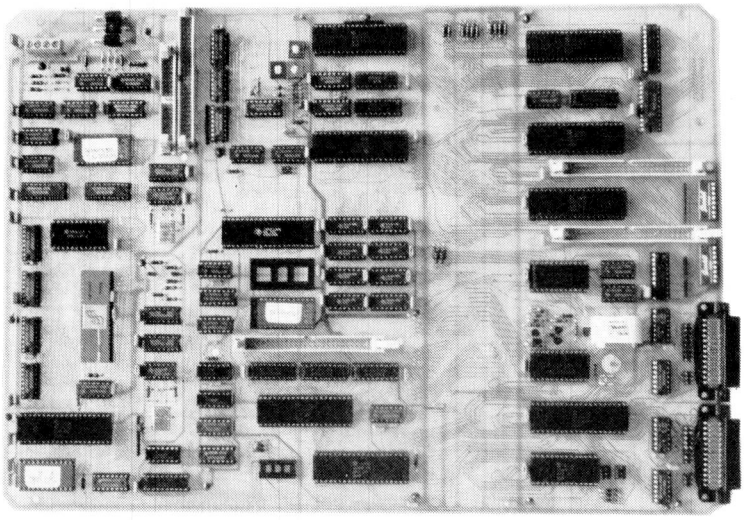

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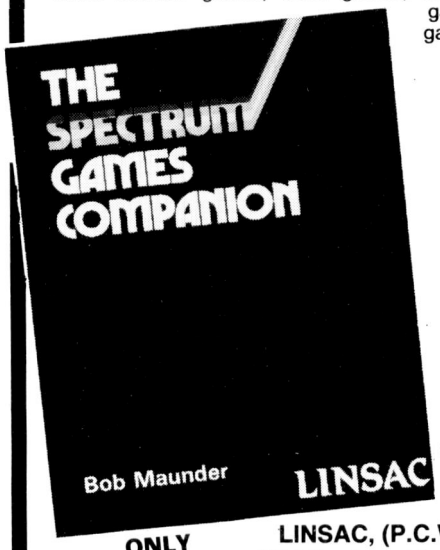

Bob Maunder is co-author of 'The ZX80 Companion' and author of 'The ZX81 Companion'. He is a Senior Lecturer in Computer Science at Teesside Polytechnic, holds an MSc degree in Computer Science, and is a Member of the British Computer Society.

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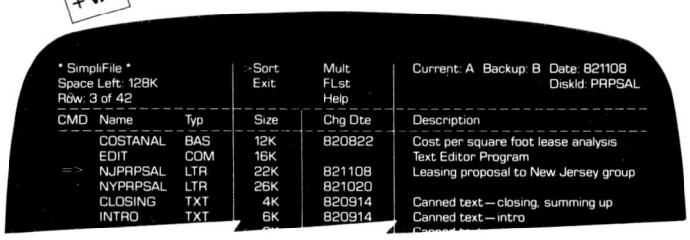

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The Need

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Most people look to computers to perform specific tasks, whether it's the business user needing to produce a spreadsheet analysis, the archivist wishing to computerise files, or the games enthusiast looking for another Space Invaders. In every instance the solution starts not with the hardware, but with the software. Find the right software, and you've found the answer to your problems. Buy the wrong hardware, and your problems have just begun.

The logical approach to buying a computer is first to choose the program which performs the required functions and only then to decide on the hardware which will most efficiently run that program.

Clearly there is a need for a magazine which helps its readers do just that. A magazine that provides solutions, not problems. A magazine that considers the ever-increasing volume of software available and guides its readers to that which will best suit their requirements.

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The Writers

The Managing Editor of SOFT will be Dick Pountain, currently MicroScope's Software Editor, and previously Managing Editor of Personal Computer World. SOFT's Editor will be Gareth Jefferson, MicroScope's present International Editor and a man with considerable experience in editing specialist consumer magazines. The contributors will include people of the calibre of David Tebbutt, Guy Kewney, Mike Liardet, Kathy Lang and Sue Eisenbach. With SOFT they will establish a new standard in microcomputer magazine publishing.

The Concept

SOFT is committed to reviewing more software in greater depth than any other microcomputing magazine. It will not merely make mention of the software package and documentation, it will thoroughly analyse every program in its entirety.

SOFT will certainly not ignore hardware. But hardware will be important only in so far as it influences the improvement of software.

SOFT talks not about computers, but about what computers can do. And all those involved with microcomputing, on any level, will need to read SOFT. Every month. To get the most from their computer. To keep pace with the explosively-expanding availability of software.

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benchmark tests for evaluating software. A whole new series of review formats. For example one analysis of, say, a financial modelling package will be directly comparable with another.

The features will investigate all aspects of microcomputer software, from profiling the software authors, to arguing the merits and demerits of programming languages. Articulating the advantages which individual software packages have to offer. Analysing user requirements. And exploring the effectiveness of the solutions that software can provide.

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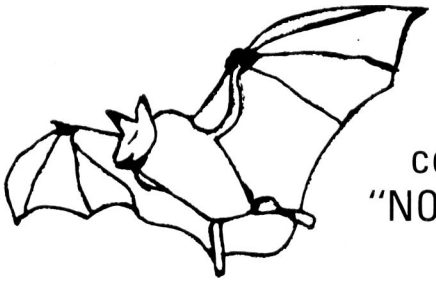

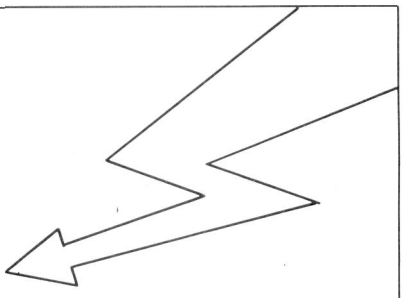

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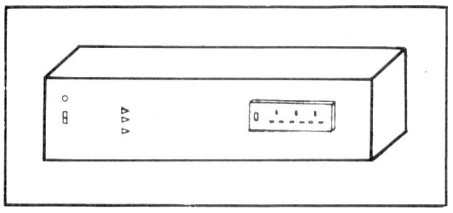

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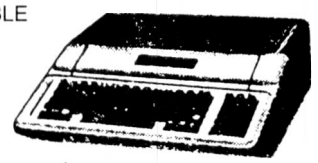

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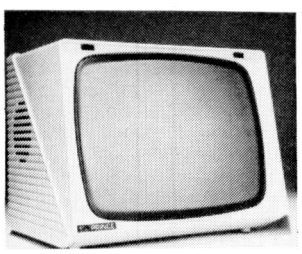

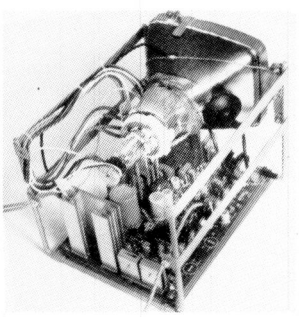

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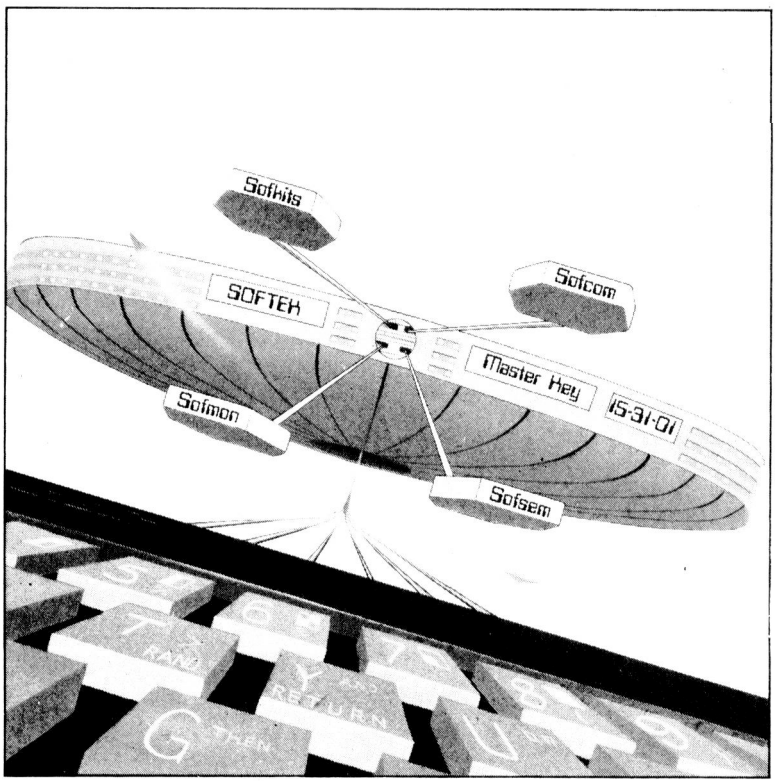

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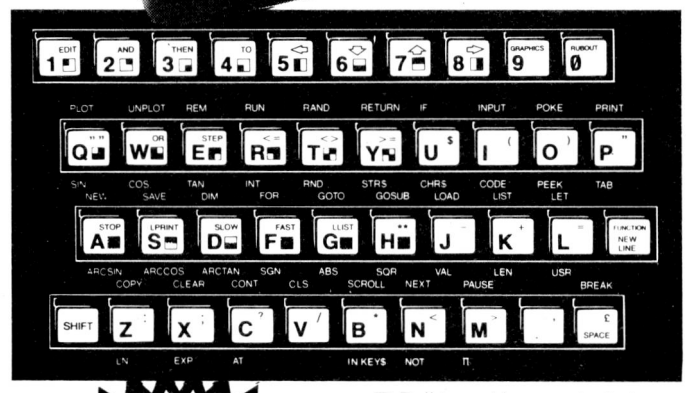

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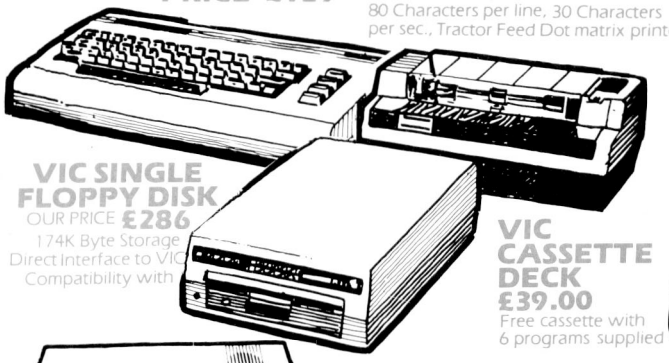

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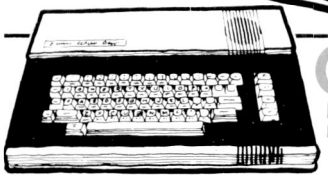

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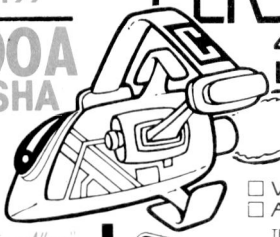

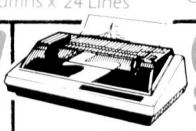

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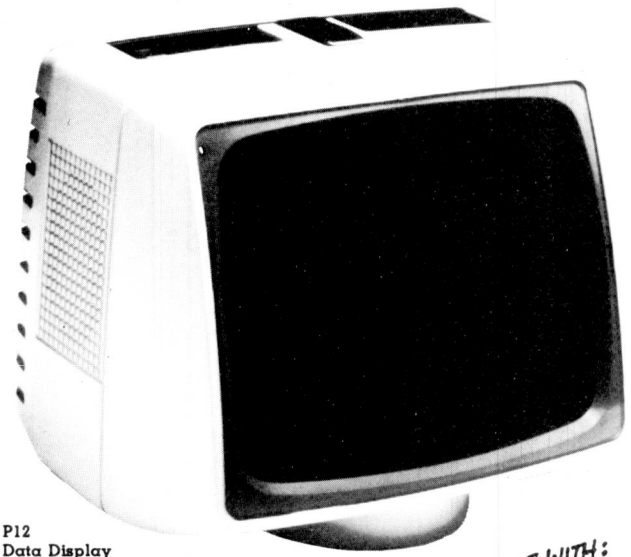

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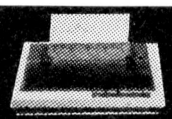

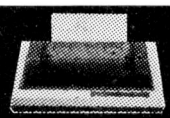

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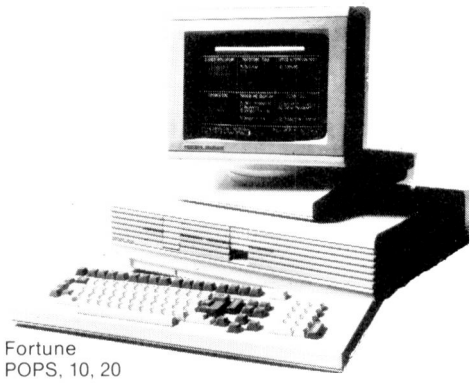

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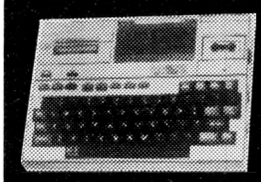

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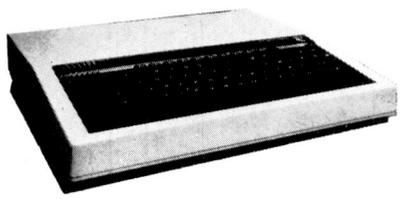

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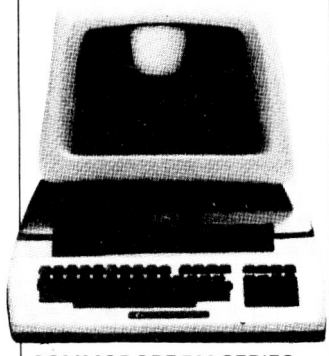

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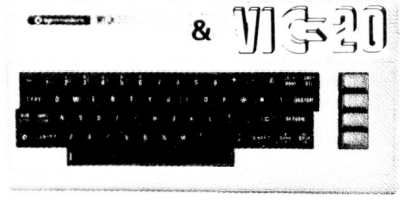

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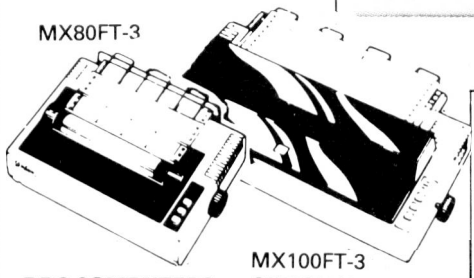

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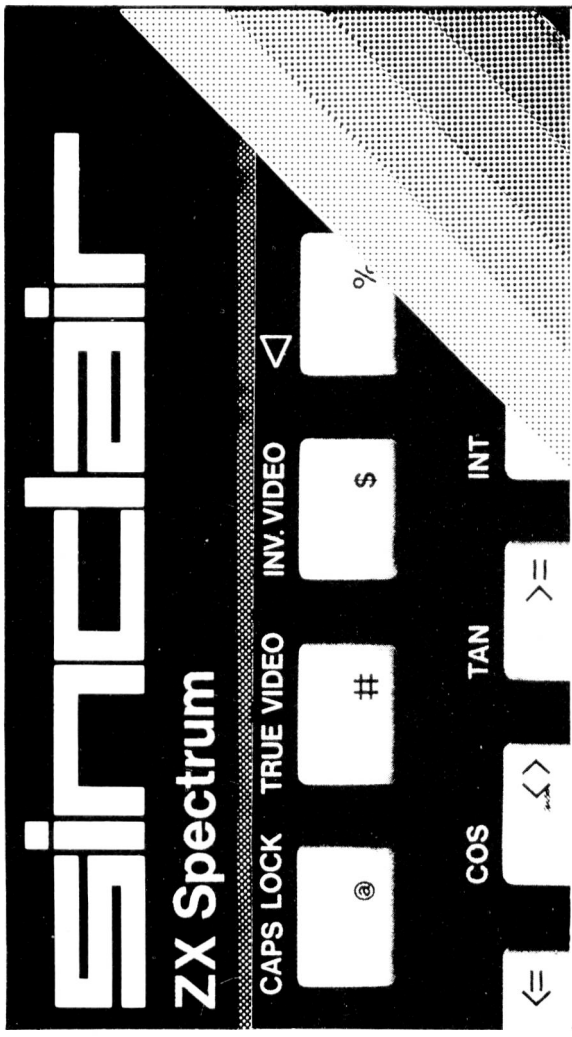

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- Predefined Alignment Formats
- Align Formats from Disk File
- Handles Pre-printed Stationary
- Interaction from Application
- Restartable at any Copy Number
- Optional End of Print Action
- MP/M* Operating System
- Multiple Printer Search
- Multiple User Search (1-15)
- Print File Priority
- Printer Error Reporting
- Time and Date Stamping
- Alignment checks
- Banner Message Print
- Align Format from Print File
- Status Reports at any time
- Interaction from Command Line
- Paper Wreck Rewind (1-10 pages)
- Search Parameters Configurable
- Multi-user access

SPRINTER User Group

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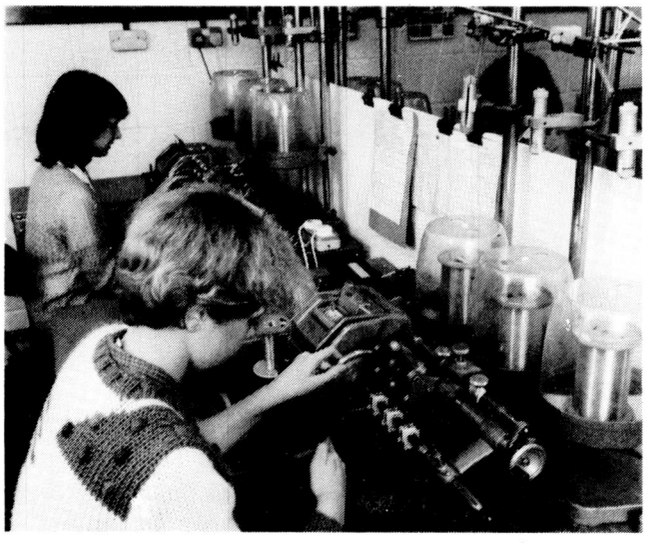

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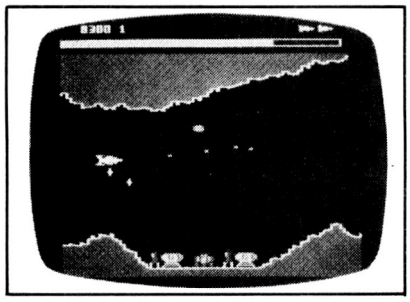

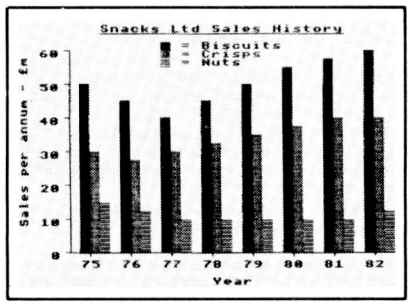

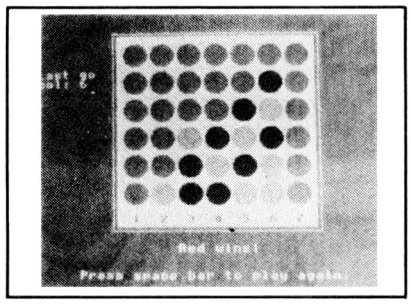

Screen Photographs of programs in BEEBUG

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February Issue: Program Features: **BEEBMAZE** – Find your way through the random maze, guided by 3D views from inside the maze – an excellent game. **FIVE-DICE** – A Beeb implementation of YAHTZEE (R), a novel dice game. Also a listing of **WINDY FIELD** – a creation from Acornsoft, **SPIROPLOT** screen doodler, and a complete memory display program in a user key. Plus **Machine Code Screen Dumps for the Epson and Seikosha Printers**: articles on **USING FILES, IDEAS ON ANIMATION** (including a Rotating Cube program), an **Introduction to the Use of Procedures, a Survey of Books on the BBC Micro**, and a Roundup of **Disc System Hints**. Plus a variety of **HINTS, TIPS AND INFO**, including a single VDU command to perform a SIDEWAYS SCROLL.

March Issue: Program Features: Life (32k), Artillery Duel (16k/32k), Square Dance, Microsketch (16k) screen drawing program in only one line of code. 3D Rotation (will rotate any object). Printers for the BBC micro – Review of Epson, Seikosha, Tandy and Olivetti. What to do with the new Operating System Chip, Disc Formatter Program, and full Disc instruction set. Newcomers article on Text and Graphics Windows. **PLUS** How to get a new Operating System ROM and a special deal on Wordwise (members only).

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.

STOP PRESS
BEEBUG has negotiated a deal with ACORN over the new 1.2 OPERATING SYSTEM ROM. BEEBUG members are offered the ROM at around half-price. See BEEBUG Feb. issue for details.

SOFTWARE DETAILS

BEEBUGSOFT : BEEBUG SOFTWARE LIBRARY

offers members a growing range of software from £3.50 per cassette. 1. Starfire (32K). 2. Moonlander (16K). 3D Noughts and Crosses (32K). 3. Shape Match (18K). Mindbender (16K). 4. Magic Eel (32K). 5. Cylon Attack (32K). 6. Astro-Tracker (32K). **Utilities**: 1. Dissembler (16K). Redefine (16K). Mindi Text Ed (32K). **Applications**: 1. Superplot (32K). 2. Masterfile (32K).

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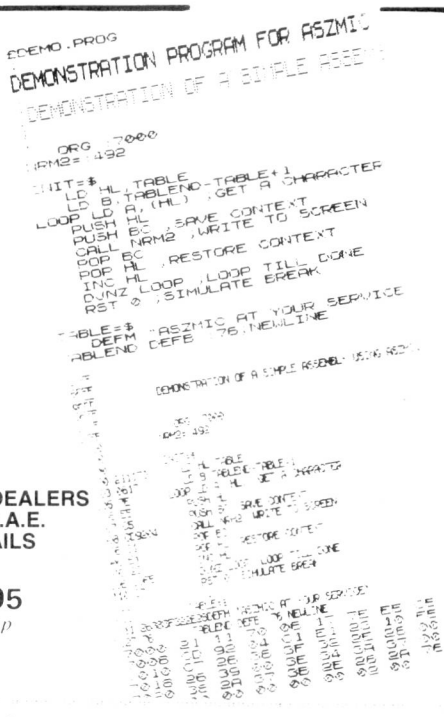

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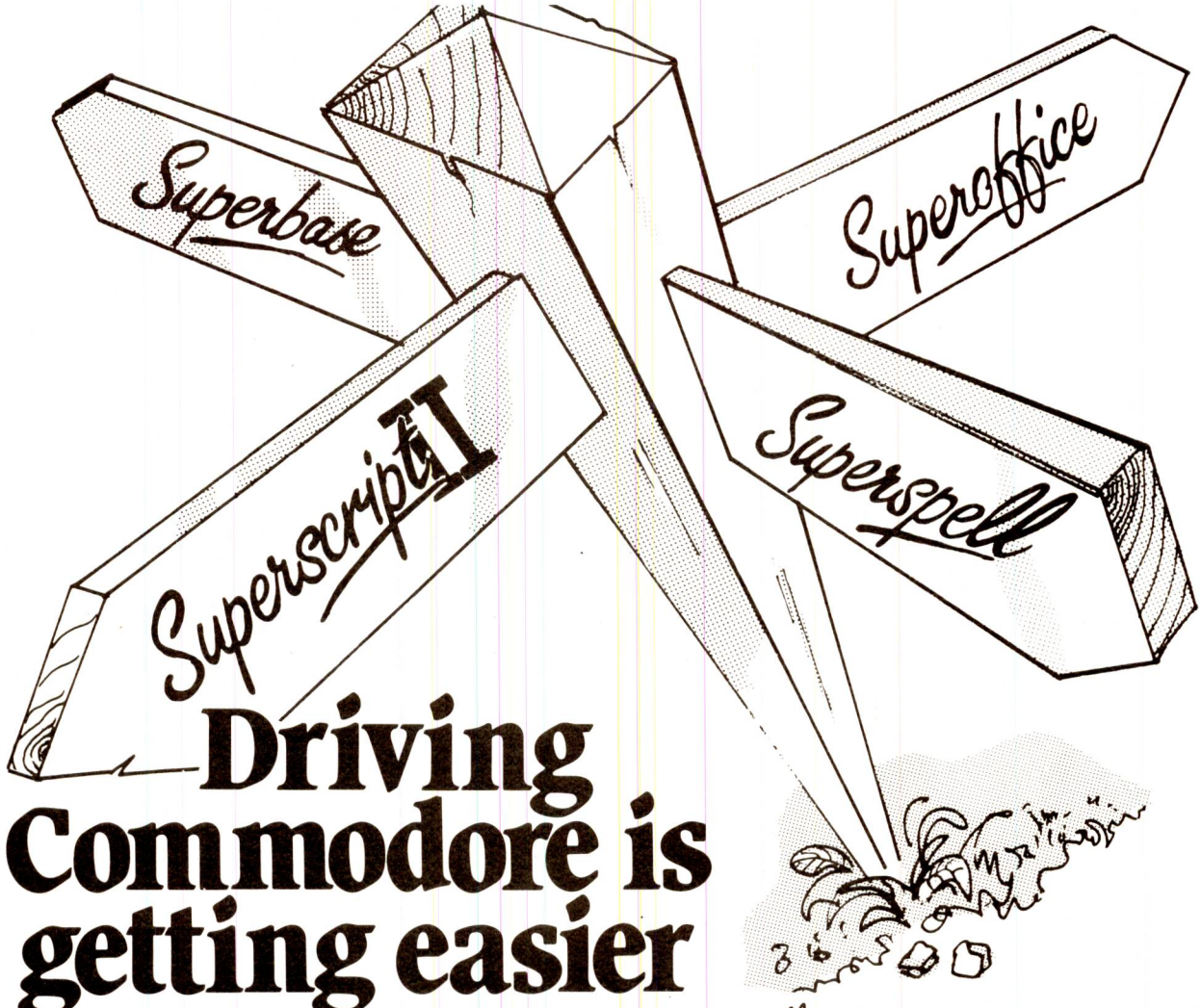

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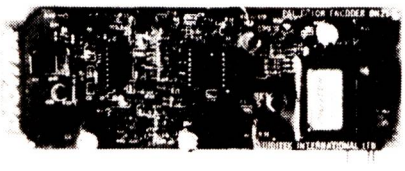

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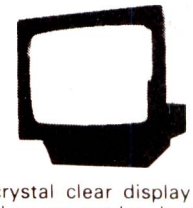

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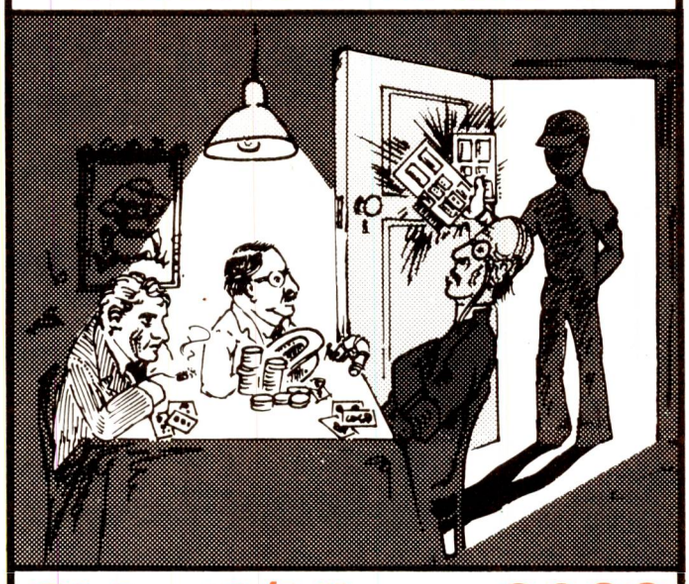

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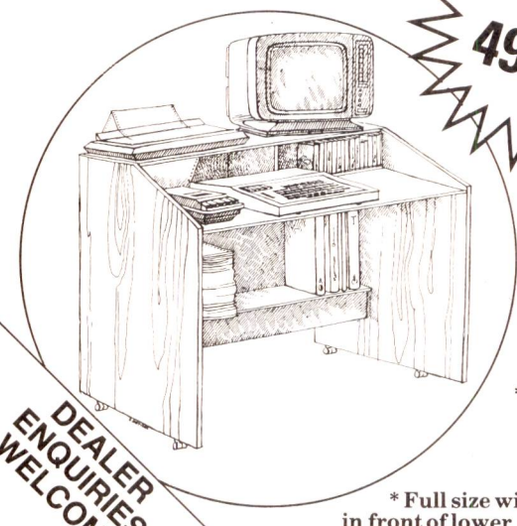

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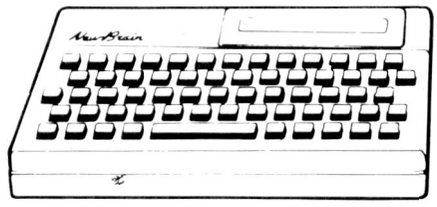

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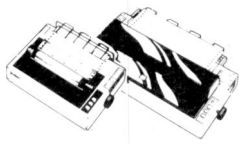

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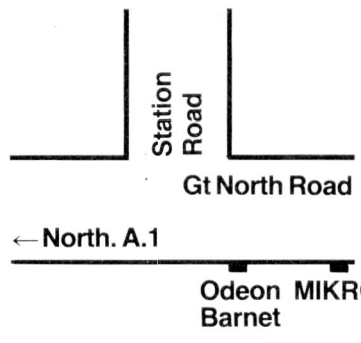

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CHIP CHAT

Let's start on a less scathing note this month by thanking the ACC for a card wishing us a happy fifth birthday. We'd now like to congratulate them on their tenth ... and talking of fifth birthdays, a heavily vetted report on the *PCW* fifth birthday, held at the Planetarium in London W1, neglects to mention the more interesting aspects of this event. Journalists, important members of the industry and honoured publishers from VNU (*PCW*'s owner), mingled in a great uproarious celebration which ended abruptly at 9.30pm, only after the champagne had run out and had been replaced by something one might normally add to fish and chips ... Celebrations relocated and continued deep into the night in a nearby pub. Rumour has it that certain people (we're forbidden to mention which ones) had a good time ... A recent issue of *Which Micro?* reveals a warmhearted competition offering a BBC Computer or disk drive as the first prize. As is customary in these competitions, a tempting picture of one of the prizes was shown. How strange that it was a picture of an Oric instead of a BBC? – that ol' Oric gets everywhere ... Computer shows gets more snobbish every day. A press release about the Office Automation Show insists that 'Class consciousness is a key issue in the spread of office automation systems in the UK'. Isn't class consciousness a key issue in the spread of anything that costs money? Naturally, the exhibition last year attracted 'a large percentage of directors and senior managers from a wide range of industries'. This 'class consciousness' could lead to a 'keep up with the IBMs' phenomenon taking over our computerised offices before long. How about company computers with vinyl roofs or managerial printout paper with watermarks!... Fed up with having your press releases or sales leaflets thrown out by your contemptuous public? Lowe 'Electronics' odd logo is a mystery which has often puzzled *PCW* hacks. In vain we have considered sine waves, voice patterns, martian landscapes and oceans. But the world's great mountain ranges, deserts and cliff faces are nothing to do with Lowe's logo. No, Lowe has a deep love for the comforts of home. The logo symbolises the Derbyshire hills ... Sinclair's recently published company profile and facts report for 1983 was in fact headed 1982. Among the more conventional reasons put forward for this is that, in the distant future, when people are – as they always will be – speculating about various social and industrial phenomena of our time, they will look at this historic document and deduce that Sinclair's great success in computers was due in part to his ability to see into the future ... And now for the bit you've all been waiting for – the Horace Competition!!! This was rather difficult to judge. Many entries were received, some of them not funny, others too rude to print and some utterly impenetrable for reasons of either handwriting, sense of humour or both. It was thought that, as so many of the entries were good, we should use these to bring a bit of sunshine to this sober page. But, folks, we're sorry and all that, there can be one winner and only one ... According to you, the readers, Horace games could involve the little chap setting fire to the royal corgis, neutering gay leopards (we take no responsibility for offended parents over that one), suing Atari (or being sued by Atari), being a lawyer in the sensational case of Horace v Pacman, signing over to the BBC Computer, (or becoming chairman of Channel 4!), taking a bath with two sharks and coming out of the closet and going Forth. Those entries which were more puns than games include: I was a teenage Horace, A horace of a different colour, the king and Horace, and (lord preserve us) a chip off the old horace. The ones which came close and caused a great dilemma for *PCW*'s overworked editors were: The Last Horace – the only computer game you'll ever need, Horace leads the SDP (using joystick to steer carefully left/right), Horace sends Eliza to a psychiatrist and Horace Sings Opera (making the most of the BEEP command). But the winner, by a pretty narrow margin has to be Horace – This is Your Life: The ultimate graphic adventure! Struggle to remember people you haven't seen for years, your only clue being Eammon telling you which adventure you met them in. Answer impossible questions about your life, supply witty anecdotes at a moment's notice and keep smiling while some chap you're supposed to have been at school with tells everybody how you got drunk and fell into a river. Only after you have survived half an hour of terrifying memories can you accept the 'Red Book'. Totally random questions and meetings. Not to be missed! Congratulations to Terry Kavanagh of Letchworth in Herts for that piece of wit rivalled only by that which features all the time in Chip Chat ... £10 and copies of both Horace games will be on their way to you by the time you read this... Thanks also to all the other readers who joined us in having a laugh at Horace's expense. We hope he isn't too offended.

BLUDNERS



Fallible beings that we are, we admit our culpability for some recent oversights.

In the April issue we apologize for the stir we caused with the PET Billy program. Quite how this error occurred is a mystery both to us and to the author, but somehow two lines went missing from the listing despite appearing on the screen ok. Anyway, the following two lines should be added.

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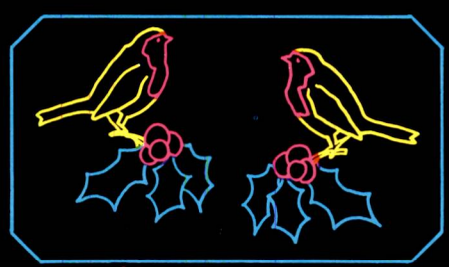

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