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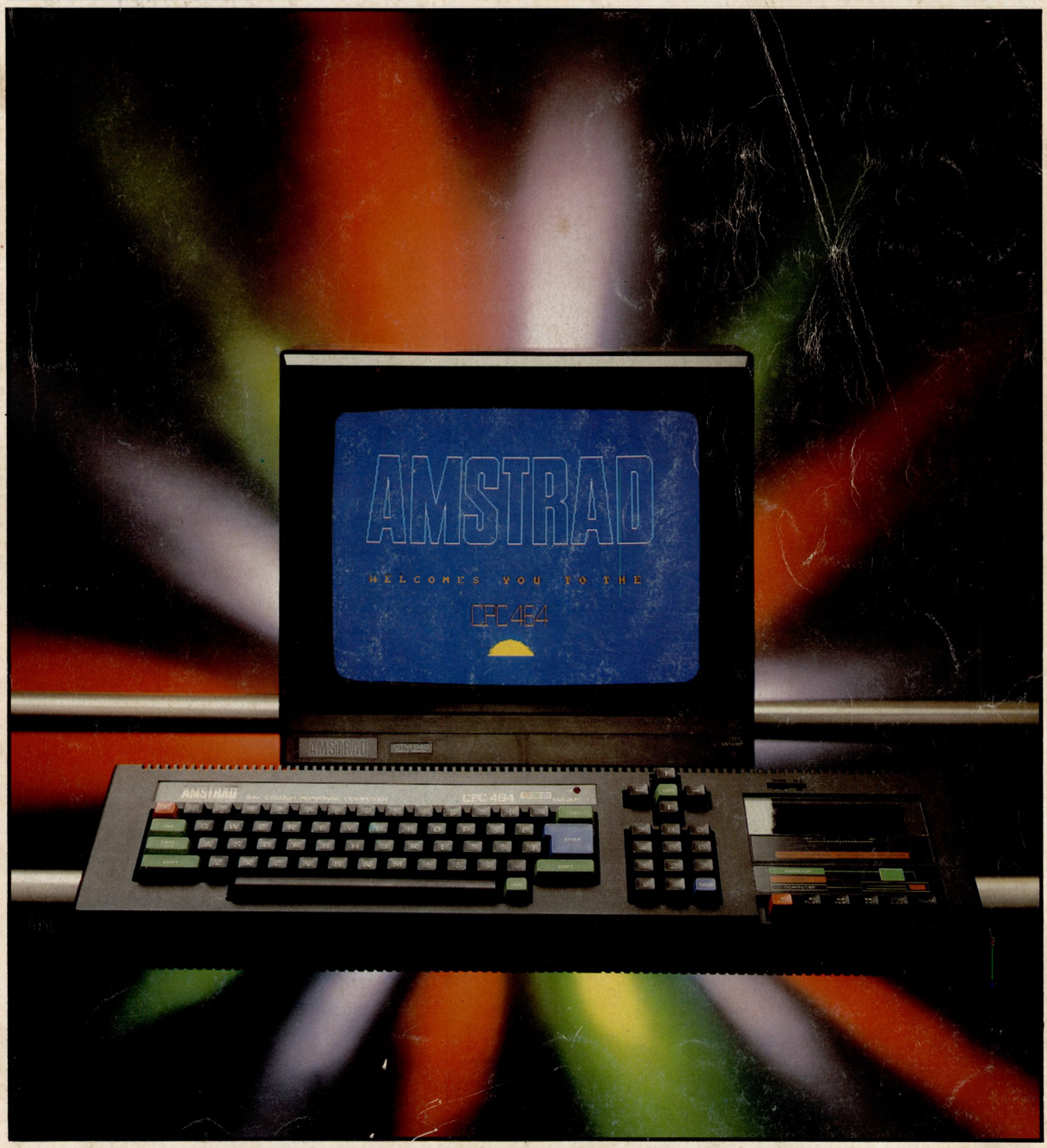

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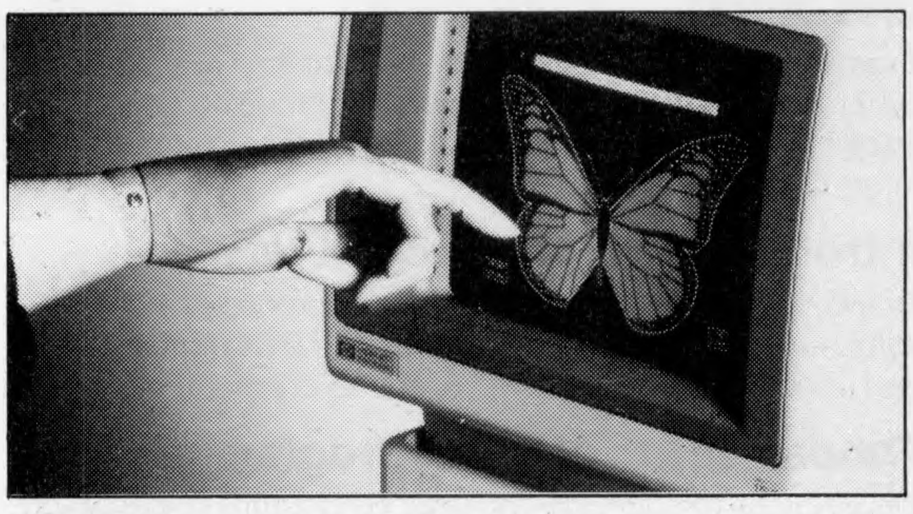

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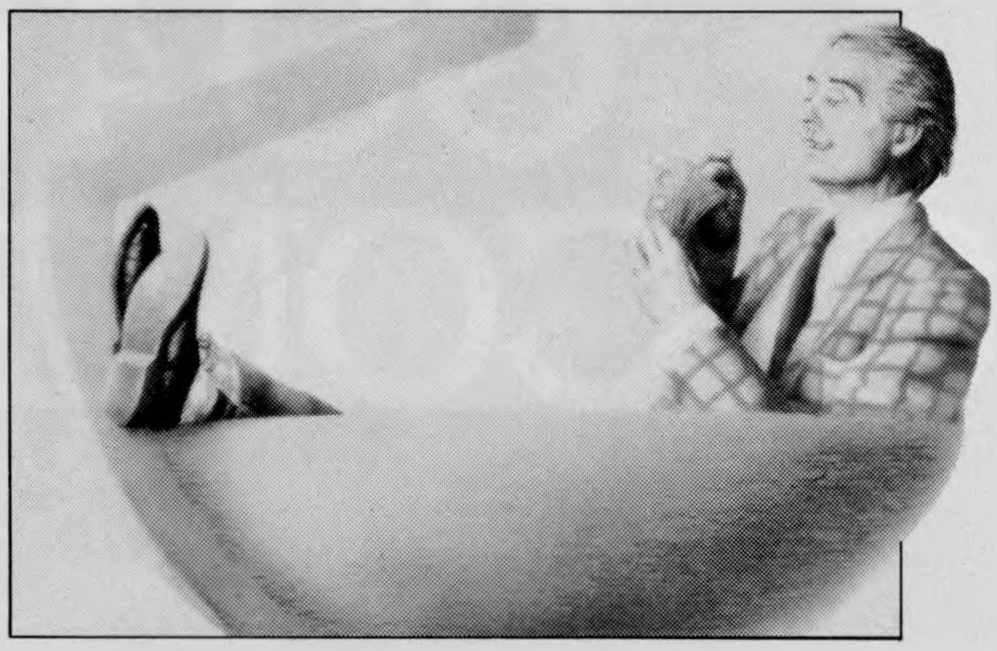

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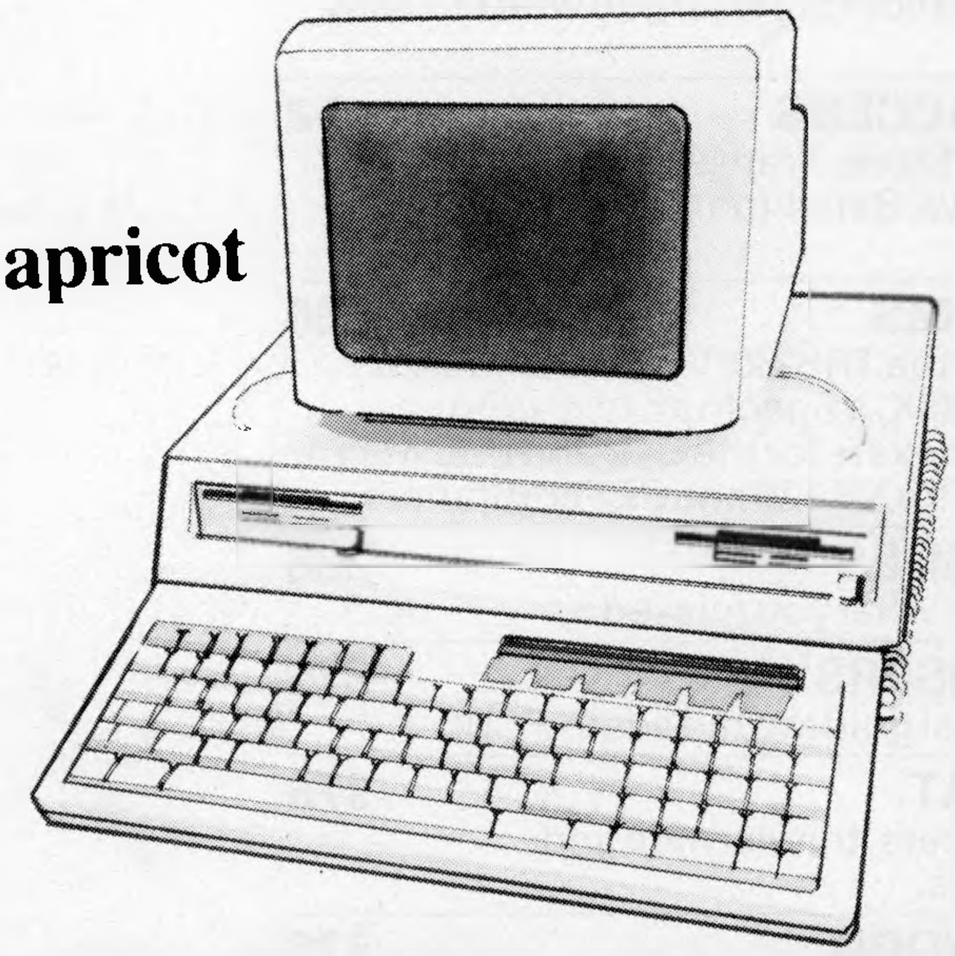

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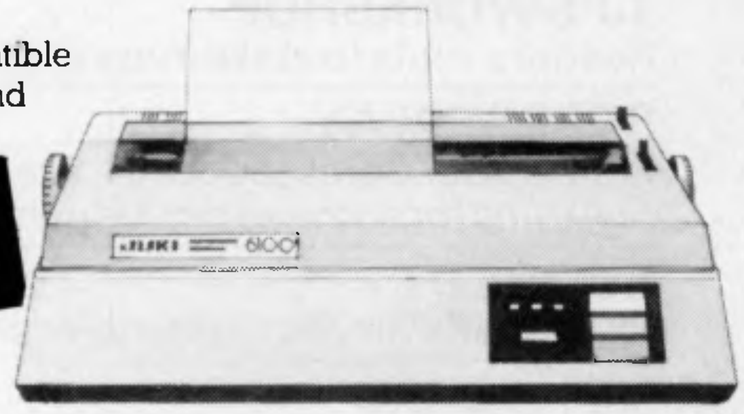

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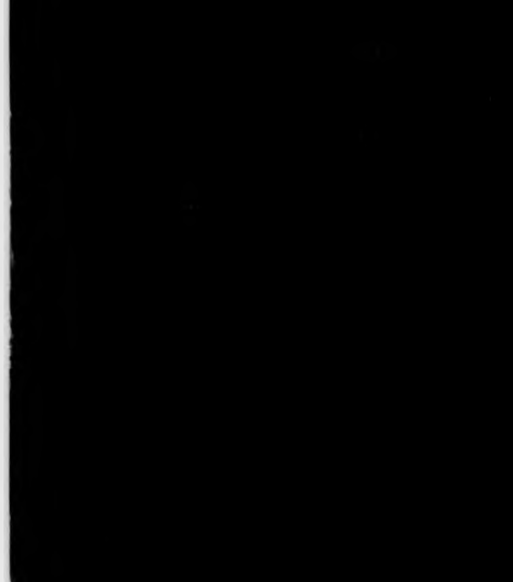

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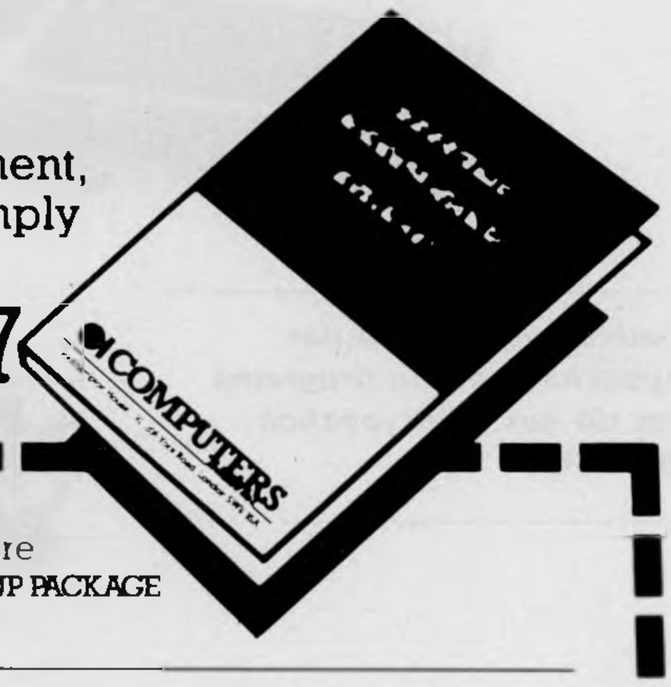

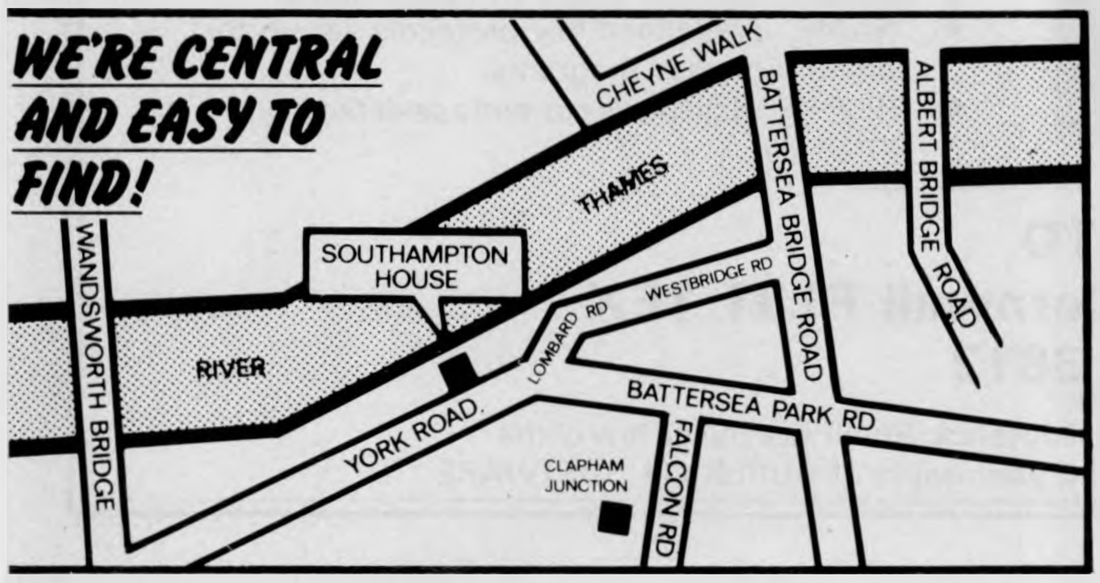

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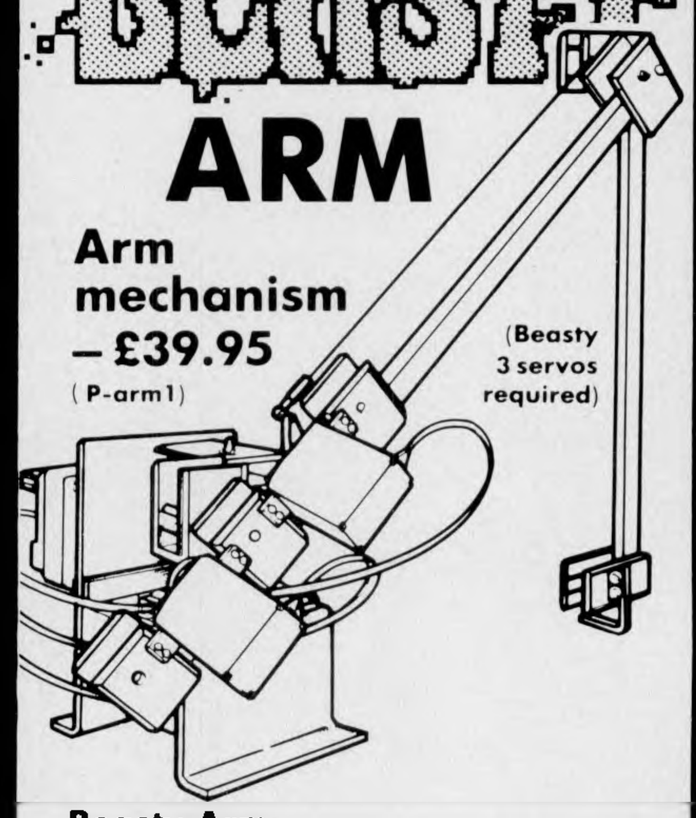

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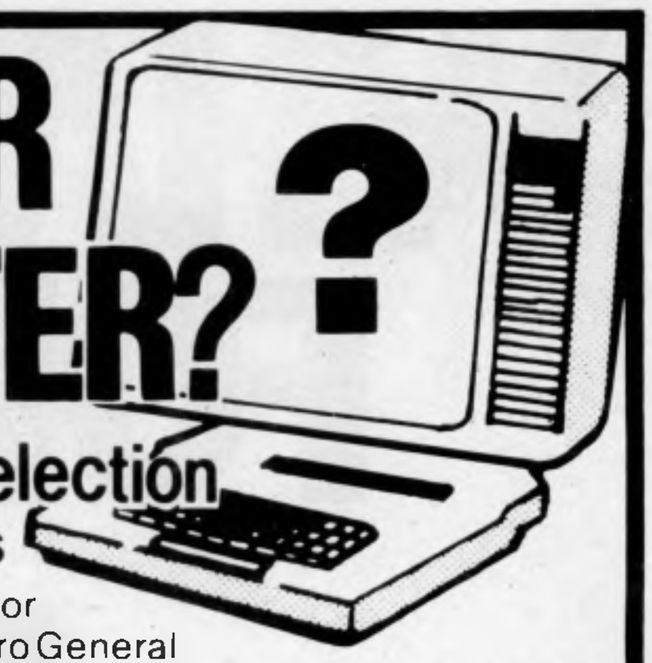

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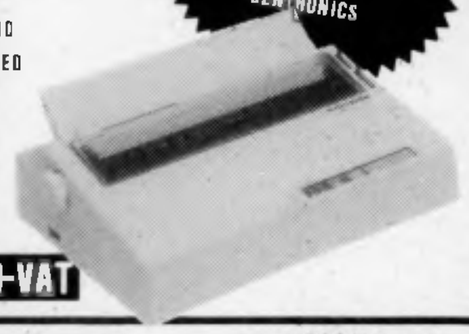

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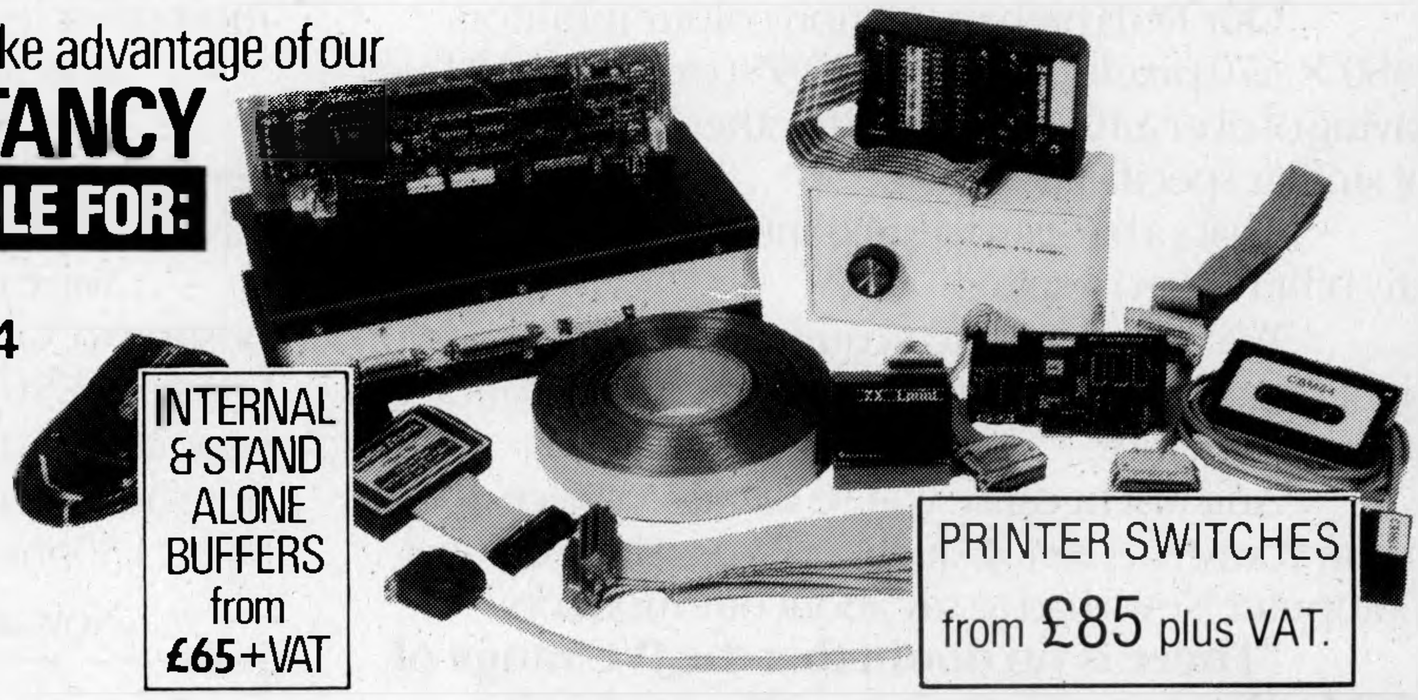

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27128-250	£22
3242	590
4027	95
4116-200	110
4164-150	495
4532-3	250
4816A-100	300
5101	300
5514	250
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6116L-120nS	650
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6264L-15	£32
6402	350
6502A	490
6502CPU	350
6503	800
6521	175
6522VIA	325
6530RRIOT	£11
6532RIOT	650
6545 CRTC	999
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6800	220
6802	275
6803	350
6805	670
6808	520
6809	950
6810	125
6821	175
68B21	220
6840	375
6843	£12
6845	650
6846	625
6847	650
6850	175
6852	250
6854	650
68B54	850
6859	£4
6875	550
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8035	600
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8085A	425
8088	£18
81LS95	140
81LS96	140
81LS97	140
81LS98	120
8123	125
8131	275
8154	£9
8155	495
8156	350
8202	£25
8212	150
8214	425
8215A-300	300
8216	130
8224	220
8226	250
8228	220
8236	00
8243	270
8250	950
8251	440
8253	400
8255	375
8256A	£35
8257	450
8259	450
8271	£60
8279	£40
8282	450
8283	450
8284	350
8288	00
8555	475
88LS120	00
8T26A	99
8T27	150
8T28A	120
8T31	350
8T95N	90
8T97N	90
9602	220
AM26LS33	150
AY-3-1015	300
AY-3-1270	875
AY-3-8910	400
AY-3-9812	500
AY-5-1013	300
AY-5-1350	388
AY-5-2376	600
AY-5-3600	750
COM8017	275
COM8116	700
DM8131	275
DP8303	00
DP8304BN	250
DS3691	00
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DS8820	110
DS8830	110
DS8831	125
FD1691	£15
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INS8080N	1060
MC1488	85
MC1489	85
MC14411	750
MC14412	805
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MC3446	215
MC3447P	315
MC6846	625
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MM5303	635
MM5307	1275
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TMS9929	£16
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Z80DMA	795
Z80ADMA	925
Z80P10	295
Z80AP10	325
Z80S10	850
ZN419	180
ZN423E	138
ZN424E	130
ZN425E-8	345
ZN426E-8	300
ZN427	130
ZN428E	410
ZN429E-8	210
ZN459	570
ZN1034E	200
ZN1040	665
ZNA234E	850

74S Series

74S00	30
74S02	30
74S03	32
74S04	30
74S06	40
74S10	40
74S11	50
74S20	40
74S22	50
74S27	60
74S32	70
74S37	60
74S74	75
74S85	295
74S112	80
74S113	90
74S124	300
74S132	110
74S133	60
74S138	100
74S139	115
74S140	60
74S151	180
74S153	182
74S155	39
74S158	195
74S163	300
74S174	250
74S175	260
74S188	140
74S189	140
74S194	295
74S195	275
74S197	400
74S201	250
74S225	240
74S240	390
74S241	250
74S244	290
74S251	225
74S257	225
74S258	250
74S260	50
74S260	70
74S262	950
74S287	225
74S288	210
74S289	200
74S299	540
74S301	350
74S365	250
74S373	400
74S374	365
74S412	380
74S470	325
74S471	620
74S472	1150
74S474	400
74S475	25
74S571	620
74S573	950

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75107/8	95
75150/54	125
75154	125
75159	195
75182/3	99
75188/9	55
7532	140
75450	86
75451/2	52
75454	70
75491/2	65

74LS

LS00	30
LS02	18
LS04	30
LS08	20
LS10	20
LS11	18
LS13	30
LS14	45
LS19	56
LS20	25
LS22	18
LS27	30
LS30	25
LS32	50
LS38	60
LS40	25
LS42	40
LS47	38
LS48	40
LS63	55
LS72	20
LS73	50
LS74	60
LS75	40
LS85	70
LS86	28
LS90	30
LS91	60
LS92	35
LS93	35
LS136	30
LS138	60
LS139	60
LS148	110
LS151	50
LS153	50
LS156	36
LS157	35
LS158	35
LS175	40
LS240	120
LS241	100
LS242	75
LS243	75
LS244	250
LS245	250
LS273	120
LS274	150
LS373	100
LS374	100
LS393	100
LS640	200
LS641	200
LS645	200
LS668	60
LS669	60
LS670	200
LS673	950

CMOS

4000	20
4001	20
4002	22
4006	65
4007	22
4008	48
4009	33
4010	33
4011	22
4012	25
4013	48
4015	55
4016	40
4017	60
4018	60
4019	58
4020	90
4023	30
4025	22
4027	43
4034	140
4039	280
4040	42
4051	45
4052	60
4053	50
4066	45
4068	22
4069	22
4070	22
4071	20
4072	22
4073	26
4075	22
4076	68
4077	22
4078	18
4081	22
4082	22
4093	20
4097	275
4099	75
4160	35
4161	99
4162	99
4163	99
4174	99
4175	105
4411	750
4412	805
4419	350
4490	450
4500	395
4501	38
4506	100
4511	46
4512	45
4519	32
4526	60
4528	50
4532	65
4549	400
4568	175
4583	100
4584	40
4585	70
4597	330
4598	290
4599	155
40101	130
40105	220
40106	38
40108	198
40109	100
40110	175
40114	240
40163	50
40193	95
40244	195
40245	195
40373	160
40374	245
45106	595

BROTHER HR-15
DAISY-WHEEL PRINTER

An exceptionally high quality Daisy Wheel printer at the price of a Dot matrix printer. 18CPS: Bi-directional, has 3K of Buffer; has clear buffer facility, Carriage skip movement, Proportional spacing; underlining; Bold print and Shadow print. Prints in two colours; Super and subscript facility. Impact control facility to vary pressure on paper for making carbon copies. Has Centronics parallel or RS-232 interface. Connects directly to BBC Micro. A ribbon cassette plus a separate red ribbon. Optional extras: Single Sheet Feeder takes up to 150 A4 sheets; & Keyboard that transforms HR15 into a sophisticated electronics typewriter. Attractively finished in Beige.

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Single Sheet Feeder..... £199
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BBC Model B £346

BBC MICRO WORD-PROCESSING PACKAGE

A complete wordprocessing package consisting of BBC Micro Model B; Zenith 12" Green Hi-res Monitor; twin cased 200K Teac Drives, the popular Wordwise wordprocessor, Watford's own highly sophisticated 62file DFS interface, world renown Brother HR15 Daisy Wheel Printer, Beebplot & Beebcal spreadsheet Analysis software discs, 10 blank diskettes, 500 sheets of paper, Manuals and all cables. All you require is a mains power point to have it up and running (we even supply the mains 4 way mains trailing socket).

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5¼" DISKETTES
Lifetime Warranty)
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- **CS400S** MITSUBISHI Single, 80 track, Double sided, 40/80 switchable, 400K **£340**
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- **CD800S** MITSUBISHI Twin, 80 track, Double sided, 40/80 switchable, 800K **£465**

Carriage on Drives £7 (Securicor)

TERMEMU
(A Terminal Emulator ROM for BBC Micro)

Use your BBC Micro as a VDU terminal, connected to any other computer with a V24 or RS423/RS232 serial interface.
Transfer text files in either direction, using disc or tape filing system.
Powerful function set allows emulation of popular mainframe terminals, including full DEC VT52. A tailoring program is included which allows you to define your own terminal and save the file on disc or tape.
The TERMEMU ROM is entered either using *VDU, or directly when the BBC micro is switched on.
Features include:

- Compatible with BT GOLD electronic mail service
- Full BBC graphics availbale
- Split baud rate for receive/transmit
- User-defined function keys
- Visible control codes (for debugging protocols)
- Full cursor addressing
- User-definable addressing convention
- ALL OS commands available, even when online
- SPOOL and EXEC, even at 75baud
- Parity, start/stop and number of bits
- Change baud rates online
- Online/local operation
- Runs in any mode
- Comprehensive manual and fitting instructions

ALL THIS AND MORE FOR ONLY

£24

(Price includes tailoring software on disc or cassette and manual)
Suitable cable for RS423 domino to V24 **ONLY £5**

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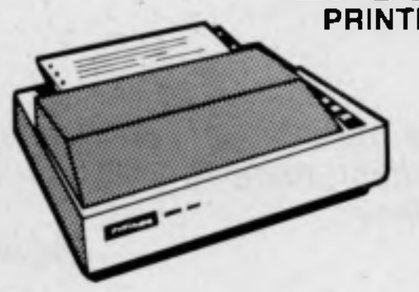

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10" Tractor/Friction feed, 160 CPS, 11x9 matrix, 137 columns max, Bidirectional, Logic seeking, proportional spacing, Hi-res bit image, Italic & Elite characters, underlining, subscript & superscript.
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100 CPS, 9x9 matrix, dot addressable graphics, Condensed & Double width printing, Normal, Italics & Elite characters, Tractor Feed, Bi-directional, logic seeking, Centronics interface standard.
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EPSON RX80 F/T
Same as above but has friction and tractor feed attachment. **£259**

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To interface above printers to BBC Micro. **£8**

We stock a wide selection of BBC Micro Hardware, Software and Firmware like:
Watford DFS, Beebmon, Screen Dump ROM, Printer ROM, Disassembler, LOGO, FORTH, PASCAL, Wordwise, Disc Doctor, Disc Fix, Beebfont, Beebplotter Graphic Tablet, Modem, Joysticks, Lightpen, Games Software, Books etc.
Send large SAE for our BBC leaflet.

PACKAGE OFFER
BBC model B, ZENITH 12" monitor, plus TERMEMU and cables, a complete mainframe terminal for **ONLY £445**

ACCESSORIES

- **TEX EPROM ERASER.** Erases up to 32 ICs in 15-30 min. **£33**
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- **UHF Modulator 6MH2** **350p**
- **UHF Modulator 8MH2** **450p**

CRYSTALS

32.768KH	100	7.6MHz	200
100KHz	236	8.0MHz	150
1MHz	275	8.0833M	395
1.28MHz	392	8.86723	175
1.6MHz	392	9.0MHz	200
1.8MHz	395	9.375M	350
1.843M	200	10.0MHz	175
2.0MHz	225	10.7MHz	150
2.457M	200	10.24MHz	200
3.276MHz	160	12.0MHz	175
3.2768M	150	12.528M	300
3.57594	98	14.31818	170
3.6864M	300	16.0MHz	200
4.0MHz	150	18.0MHz	180
4.032MHz	290	18.432M	150
4.194304	200	19.968M	150
4.433619	100	20.0MHz	200
4.80MHz	200	24.0MHz	170
5.0MHz	160	24.930M	325
5.185MHz	300	48.0M	175
5.24288	390	100.0M	375
6.0MHz	140		
6.144MHz	150		
6.5536M	200		
7.0MHz	150		
7.7328M	250		
7.168MHz	160		

IDC Connectors:

Speed Block type	PCB PLug with latch Strut 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"	219p	235p	345p	540p
36"	230p	250p	375p	595p

IDC FEMALE RECEPTACLE JUMPER LEADS

24"	20way	26way	34way	4way
1end	160p	200p	260p	300p
2end	290p	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
28	55p	80p
34	60p	85p
40	70p	90p
64	120p	160p

DIL PLUGS (Header)

	Solder	IDC
14pin	40p	99p
16pin	49p	106p
24pin	68p	170p
28pin	240p	290p
40pin	250p	265p

AMPHENOL PLUGS

24 way IEEEE	475p
36 way Centronics Parallel	450p

ZIF DIL SOCKETS

24 way	565p
28 way	750p
40 way	799p

VIDEO MONITORS

- ZENITH 12" Hi-Res. Green or Amber Monitor. 40/80 column select switch. Attractively finished **£75**
- KAGA RGB 12" Standard Res. Colour **£210**
- KAGA RGB 12" Medium Res. Colour **£259**
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- MICROVITEC 1451 Hi-res 14" Monitor incl. Lead **£319**
- Connecting lead for KAGA **£5**

EURO (DIN) CONNECTORS

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

EDGE CONNECTORS

TWO ROWS	.1"	.156"
2x 6 way	—	110p
2x12 way	—	160p
2x15 way	—	165p
2x18 way	210p	175p
2x22 way	215p	250p
2x23 way	175p	—
2x25 way	285p	275p
2x28 way	190p	—
2x30 way	310p	—
2x36 way	360p	—
2x40 way	380p	—

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	85p	80p	80p	100p

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

48K SPECTRUM

TASWORD TWO THE WORD PROCESSOR

64 CHARACTERS PER LINE ON THE SCREEN AND TO PRINTERS!
MICRODRIVE COMPATIBLE — instructions supplied

"The number of on-screen prompts, together with the excellent manual, make it ideal – even for an absolute beginner."

PERSONAL COMPUTER WORLD September 1983

"What makes a word processor more or less versatile is its control features. Tasword Two offers an impressive selection and the tutor program succeeds in demonstrating them admirably."

ELECTRONICS AND COMPUTING November 1983

"Tasword is showing a degree of sophistication that business computers took many years to develop."

WHAT MICRO? October 1983

TASWORD TWO The Word Processor*

Your Spectrum becomes a **professional** word processor with TASWORD TWO. TASWORD TWO gives you an amazing **64 characters per line** on your screen. This is ideal for standard A4 paper and TASWORD TWO prints your text just as it appears on your screen.

Tasword Two drives the following interfaces:

Cobra RS232 I/O Port	*ADS Interface*
Euroelectronics Interface	*Kempston Interface*
Hilderbay Interface	*Morex Interface*
Sinclair ZX Interface 1	*Tasman Interface*

The same program drives these interfaces. A short easy to follow set of instructions takes you through setting up your Tasword Two to drive the interface you have or choose to buy.

Tasword Two also drives the ZX printer.

Tasword Two is readily adapted for the microdrives to give super-fast saving and loading of both program and text. The microdrive instructions are supplied with the Tasword Two manual.

£13·90 fully inclusive mail order price.

TASWORD TWO TUTOR

TASWORD TWO comes complete with a manual and a cassette. The cassette contains your TASWORD TWO **and** TASWORD TWO TUTOR. This teaches you word processing using TASWORD TWO. Whether you have serious applications or simply want to learn about word processing, TASWORD TWO and TASWORD TWO TUTOR make it easy and enjoyable.

TASWORD TWO £2 Demonstration Cassette

See for yourself the powerful features of TASWORD TWO. Send just £2 for the Tasword Two demonstration cassette. A voucher is included which gives you £1 off the price of TASWORD TWO.

All prices include VAT and post and packaging

* Available from larger branches of Boots

For further information on all these products send an s.a.e. with "Tasman Brochure" written on the flap.

Send cheque/P.O. or Access number with order.
Telephone Access orders: Leeds (0532) 438301

TASPRINT

A must for dot matrix printer owners! Print your program output and listings in a choice of five impressive print styles. Drives all the printer interfaces listed under Tasword Two and all dot matrix printers with bit image graphics capabilities. You can also use TASPRINT to print Tasword Two text files. TASPRINT gives your output originality and style! Send s.a.e. for brochure which includes TASPRINT output.

£9.90 fully inclusive mail order price

TASWIDE – 64 characters per line!

A machine code utility program, TASWIDE **doubles** the information that your own programs can display. Make a simple change to your print statements and your output appears on the screen at 64 characters per line instead of the normal 32. Both print sizes can be mixed on the screen. 16K and 48K versions supplied on the same cassette.

£5·50 fully inclusive mail order price

TASMATH 1

Mathematics education. Three programs on one cassette:
TASIMEQ – simultaneous equations
TASQUAD – quadratic equations
TAS-TRIG – trigonometry of right angled triangles.
Available for the 16K and 48K Spectrum and for the BBC model B.

£5.95 fully inclusive mail order price

TASMAN PARALLEL PRINTER INTERFACE

Plug into your Spectrum and drive any printer fitted with the Centronics standard parallel interface. Supplied complete with ribbon cable and driving software. The cassette includes LLIST, LPRINT, and **text** screen copy software for **all** centronics printers. The user changeable interface software makes it easy to send control codes to your printer using the method so successfully pioneered with Tasword Two. The cassette **also** contains fast machine code high resolution screen copy software for Epson, Star, Seikosha, Shinwa, and Tandy Colour Graphic (in colour!) printers. Send s.a.e. for brochure which includes sample print-outs and a full list of printers supported by screen software. Compatible with microdrives/ZX Interface 1.

£45 fully inclusive mail order price

TASMAN RS232 PRINTER INTERFACE

Specification and software as above but drives printers fitted with the RS232 standard interface. A low cost route to printing – especially suitable for use with the Tandy Colour Graphic printer and the Brother portable typewriter/printers. Supplied complete with cable – please specify whether 4 pin DIN or 25 way D plug required.

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TASMAN SOFTWARE

Dept. PCW

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SILICON VALLEY COMPUTER CENTRE

01-242 2803

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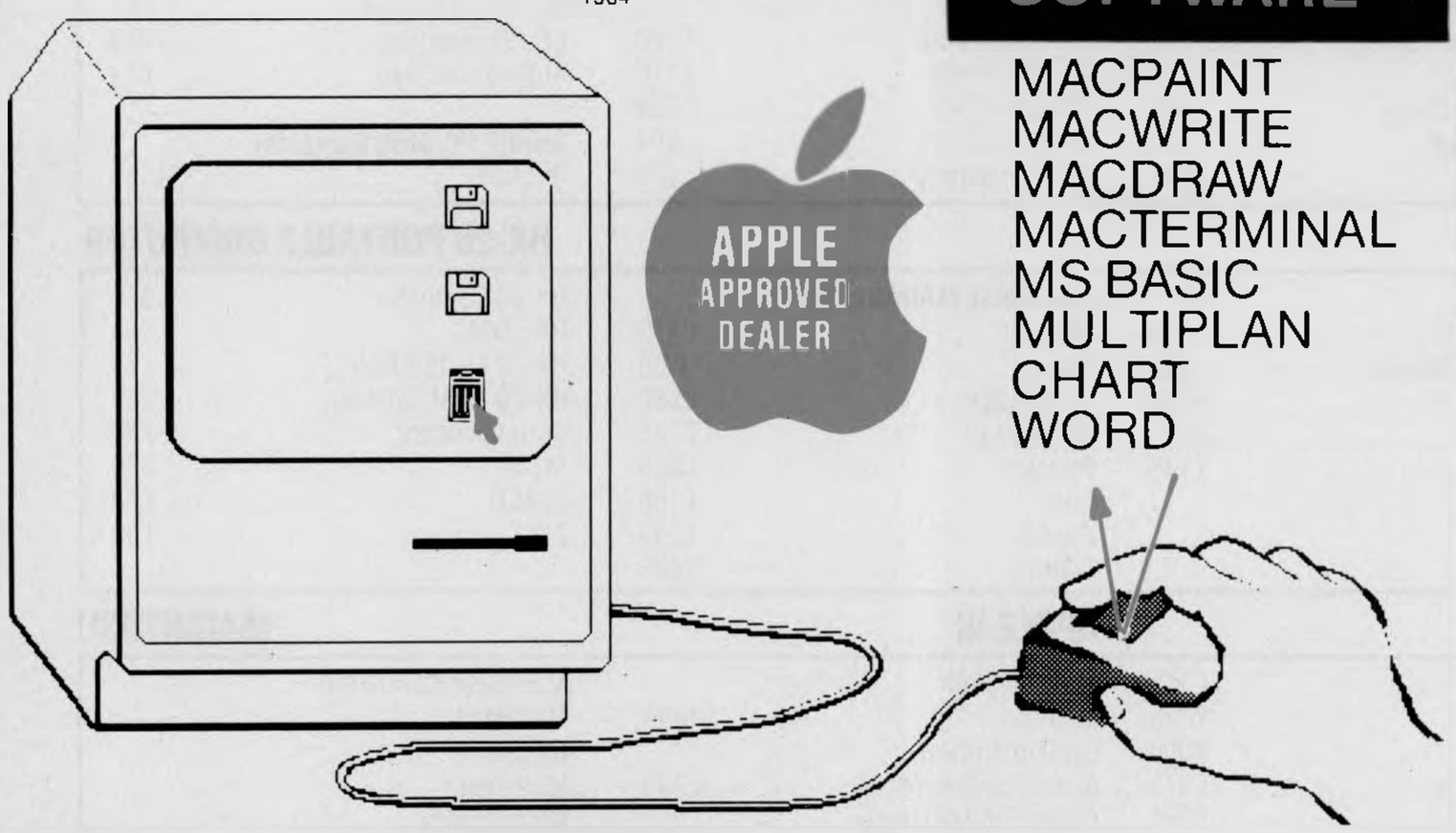

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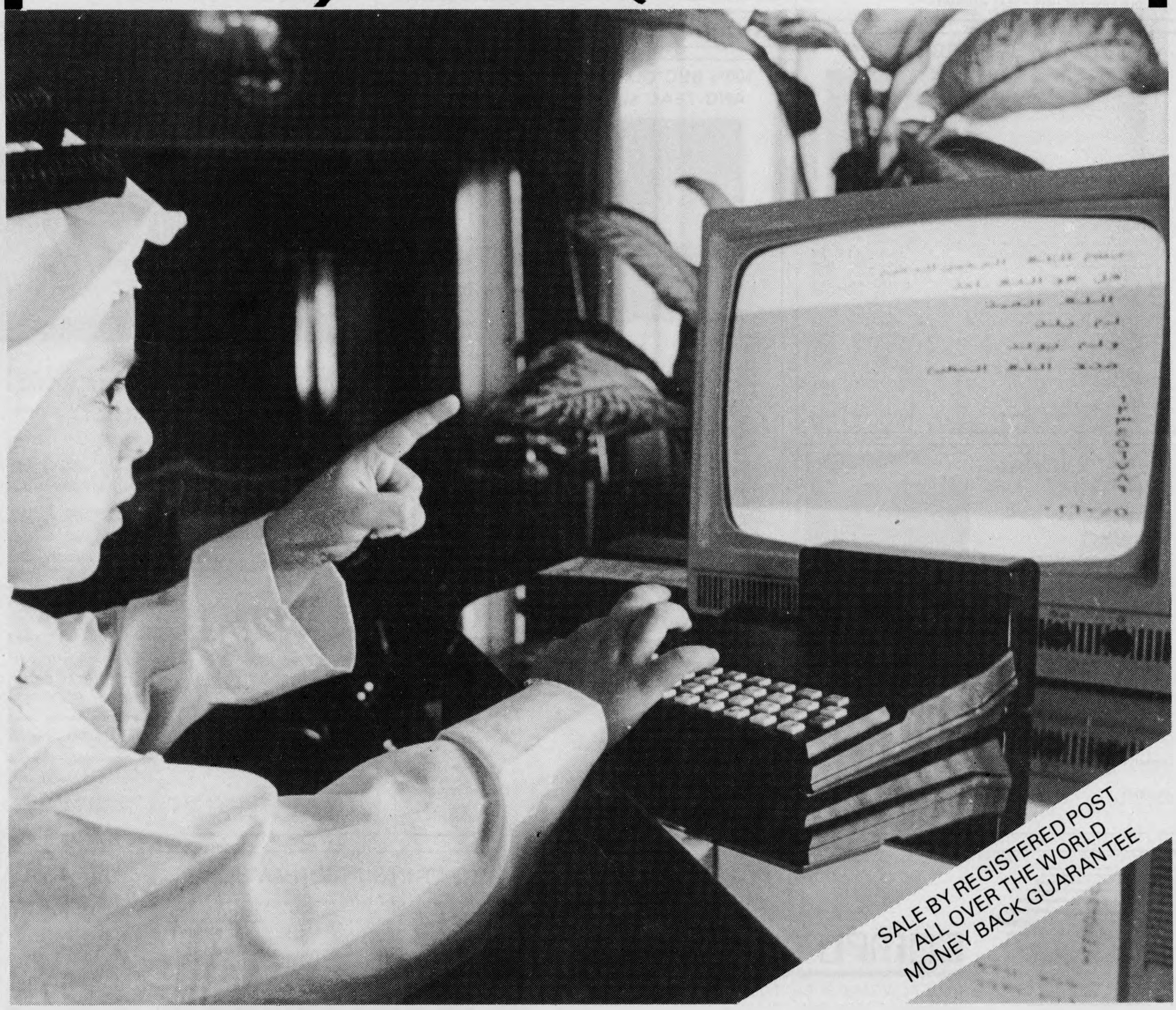

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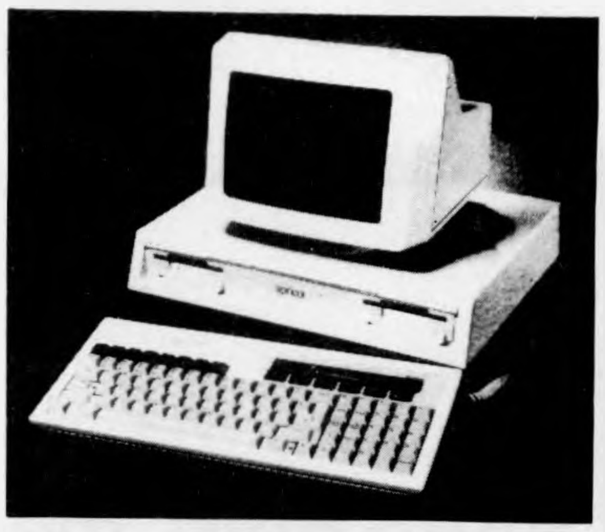

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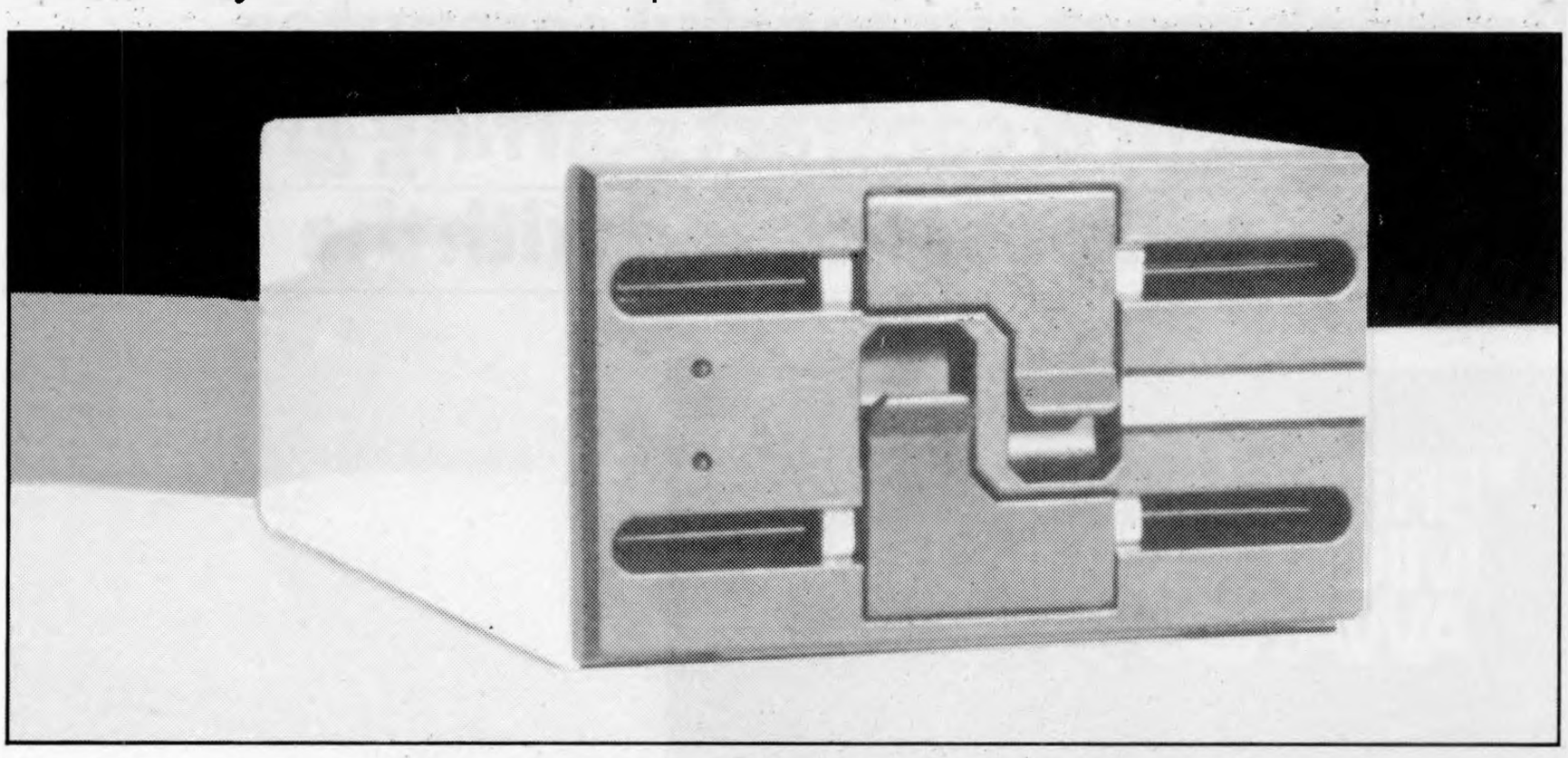

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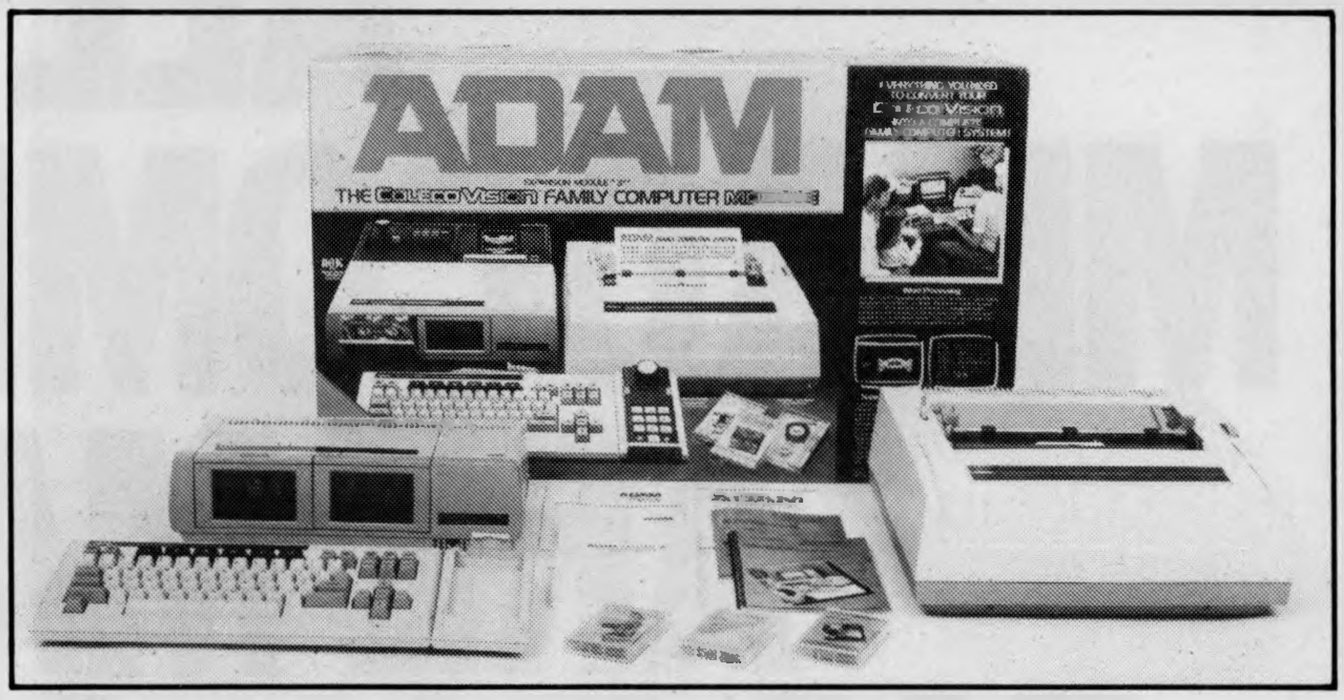

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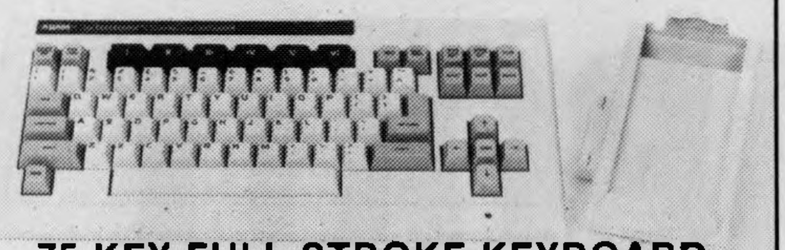

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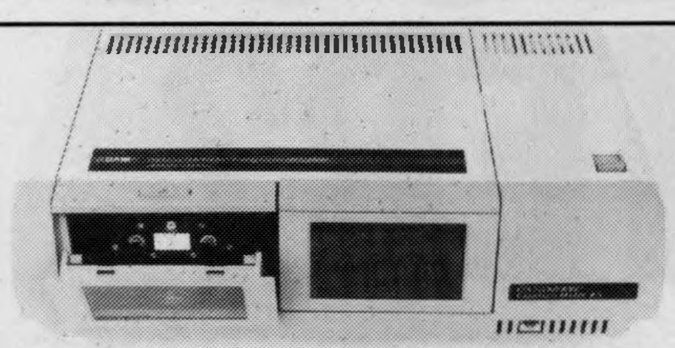
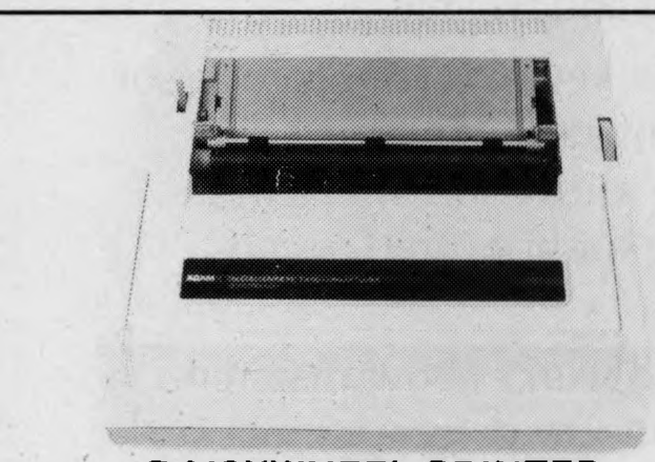
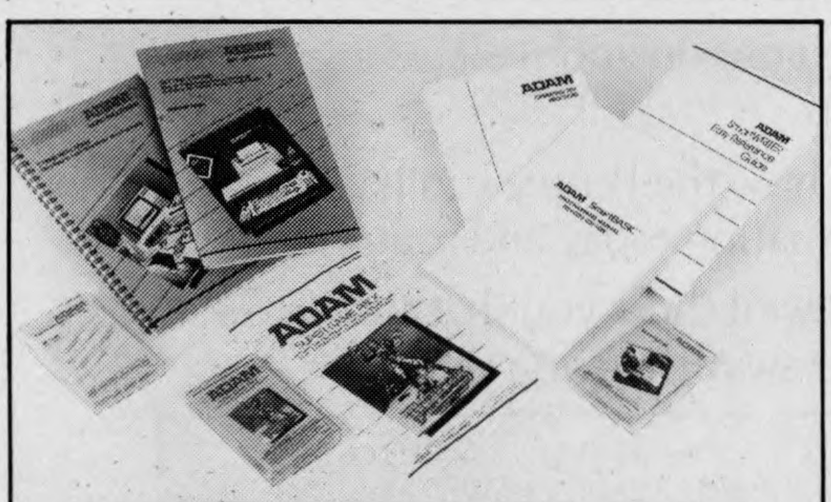


MEMORY CONSOLE & DATA DRIVE



DAISYWHEEL PRINTER



COMPREHENSIVE INSTRUCTIONS



COLECOVISION GAMES CONSOLE

QUITE SIMPLY - VALUE FOR MONEY!

If you're looking for real value in a computer system, one which can handle anything from serious Word Processing to enhanced Colecovision style video games such as Buck Rogers, look no further. The Coleco Adam is here with a package which will make you wonder if you're dreaming when we tell you about it. A price breakthrough in computer systems, Adam is comprised of an 80K RAM memory console with a built-in 256K digital data drive; a professional quality, stepped and sculptured 75 key full-stroke keyboard; a letter quality daisywheel printer and a full word processing program built into the Console. Two additional pieces of software, Smart BASIC and also 'Buck Rogers - Planet of Zoom' (the ultimate in advanced video games), are included as well as a blank digital data pack. Adam can be used with any domestic colour Television set.*

MEMORY CONSOLE/DATA DRIVE: *The heart of the Adam system is the 40K ROM and 64K RAM memory console which combines with the 32K ROM and 16K RAM in Colecovision to give you a total of 72K ROM (including 24K cartridge ROM) and 80K RAM (expandable to 144K). Built into the memory console is a digital data drive which accepts Adam's digital data packs, a fast and reliable mass storage medium that is capable of storing 256K of information, that's about 250 pages of double spaced text! The console is also designed to accomodate a second optional digital data drive.*

FULL STROKE KEYBOARD: The Adam keyboard has been designed as a professional quality keyboard that combines ease of use with an impressive array of features. It is stepped and sculptured for maximum efficiency and has 75 full stroke keys which include 6 colour coded Smart Keys which are redefined for each new application; 10 command keys which are dedicated to the word processing function, and 5 cursor control keys for easy positioning of the cursor at any point on the screen. You can attach a Colecovision controller to the keyboard to function as a numeric keypad for easy data entry. It can also be held like a calculator, a feature which makes working with numbers particularly easy. The joystick part of the hand controller can be used in the same way as the cursor control keys, to move the cursor around the screen.

LETTER QUALITY PRINTER: The Smart Writer letter quality daisywheel printer is a bi-directional 80 column printer which prints at a rate of 120 words per minute. It uses standard interchangeable daisywheels, so a variety of typestyles are available. The printer has a 9.5 inch wide carriage for either single sheets or continuous fan fold paper and uses standard carbon ribbons. It is comparable to many printers which cost as much as the total Adam package. The printer can be used either with the Adam's Smart Writer word processing program or as a stand alone electronic typewriter.

BUILT-IN WORD PROCESSOR: Adam comes with Smart Writer word processing built-in. This program is so easy to use that you only have to turn the power on and the word processor is on line and ready to go. Detailed instruction books are not necessary as the Computer guides you step by step, working from a series of Menu commands. It enables you to type in text, then completely edit or revise it with the touch of a few keys. Changes are readily made and a series of queries from the computer confirm your intentions, so that you can continuously double check your work as you type.

COMPATIBILITY WITH COLECOVISION: By using high speed interactive microprocessors in each of the modules, the Coleco Adam is designed to take additional advantage of both the 32K ROM and 16K RAM memory capability in the Colecovision. If you do not already own a Colecovision Console (£99 inc VAT), then you will need to purchase this when you initially purchase your Adam Computer package (£499 inc VAT), making a total purchase price of (£598 inc VAT).

WHAT IS COLECOVISION: Colecovision is one of the worlds most powerful video game systems, capable of displaying arcade quality colour graphics of incredible quality on a standard Colour TV set. The console (see picture bottom left) accepts 24K ROM cartridges such as Turbo and Zaxxon and is supplied with the popular Donkey Kong cartridge and a pair of joystick controllers. Colecovision has a range of licenced arcade hits available such as: Gorf, Carnival, Cosmic Avenger, Mouse Trap, Ladybug, Venture, Smurf, Pepper II, Space Panic, Looping, Space Fury, Mr Do, Time Pilot, Wizard of Wor and many others. So there you have it, Adam plus Colecovision the unbeatable combination. Send the coupon below for your FREE copy of our 12 page Colour brochure giving details on the complete Adam system.

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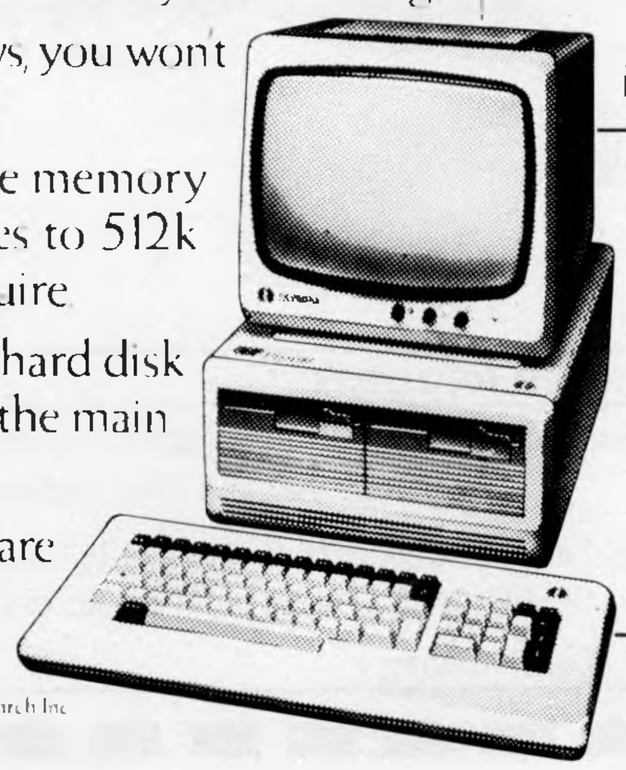

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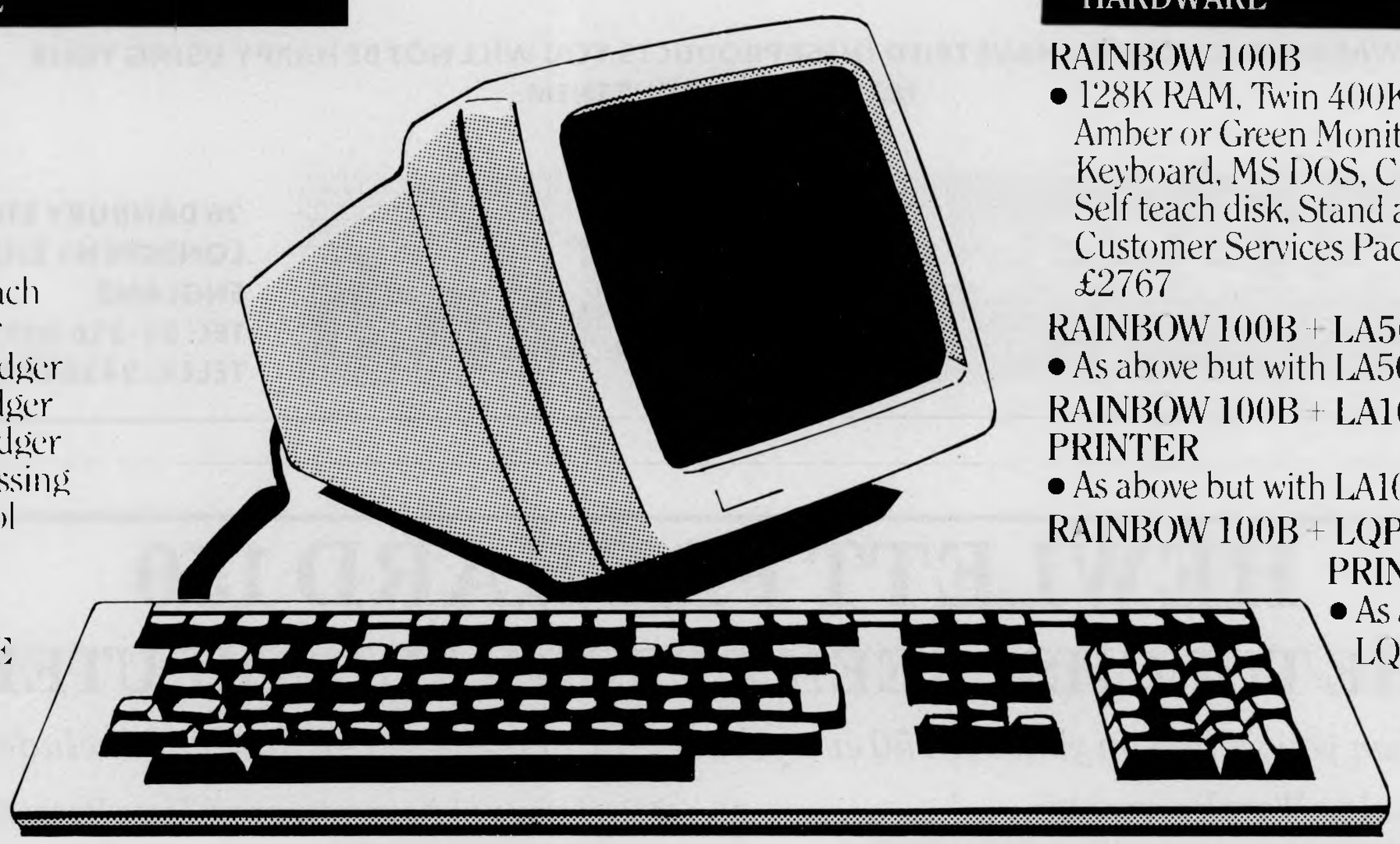

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To find out more details and the name of your local Zenith dealer contact: Geoff Stone, Marketing Support Manager, Zenith Data Systems, Bristol Road, Gloucester GL2 6EE. Telephone: (0452) 29451. Telex: 43421.



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MBOS – MicroProducts Software Ltd; ZLAN – Zenith Data Systems Ltd; LOTUS 1-2-3 – Lotus Corp; ZenSoft – Zenith Data Systems Ltd; Peachtext 5000 – Peachtree Software; CP/M – Digital Research Inc; MS-DOS – Microsoft

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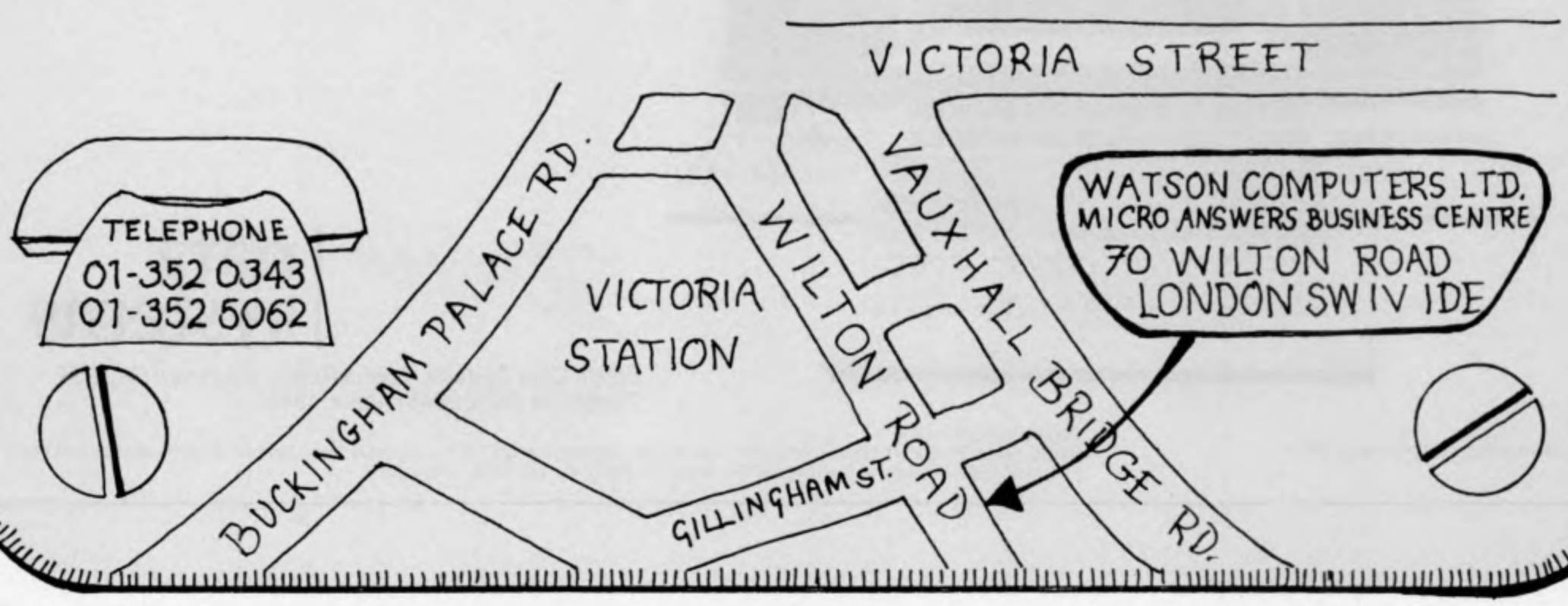

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Production of Customer Statements Brought Forward or Open Item

Examination of Sales and Purchase Invoices.

Alphabetic printout of Customers and Suppliers showing C FACC reference numbers

Customer and Supplier Files and Ledgers
Label printing

Access to sections peculiar to special versions e g Contract Section, Sales Order Control, Finished Stock Transfer, Time Recording, Sophisticated Stock Control

Inventory Valuation, Re-order, Individual Item examination, Price Lists

Screen or Printer Report in VAT 100 format

Cost and Income Centre breakdowns, reports on Liquidity, Stock, Turnover Return on Investment etc

Balance Sheet Printout including Accruals and Prepayments

Purchase Daybook entries
Supplier Ledgers,
Nominal Ledgers,
Invoices outstanding

Sales Daybook entries
Customer Ledgers,
Nominal Ledgers,
Invoices outstanding

Income, Cost, Fixed Nominal and Control Ledger Codes

Fixed Assets with cost price, present value and automatic Depreciation

Ageing of Debtors and Creditors
Ledger Totals, Depreciation,
Recording of Accruals and Prepayments
Full Audit Trail Printout

Amend Ledger Codes
Accruals and Prepayments
Journal and Trial Balance entries
(Incomplete Records available)

Comprehensive Payroll including full SSP, Payslip and Statutory Summary Printouts

Full printed Reconciliation of Book Balance and Cash at Bank

Summary or detailed Profit & Loss Printout

MAIN MENU

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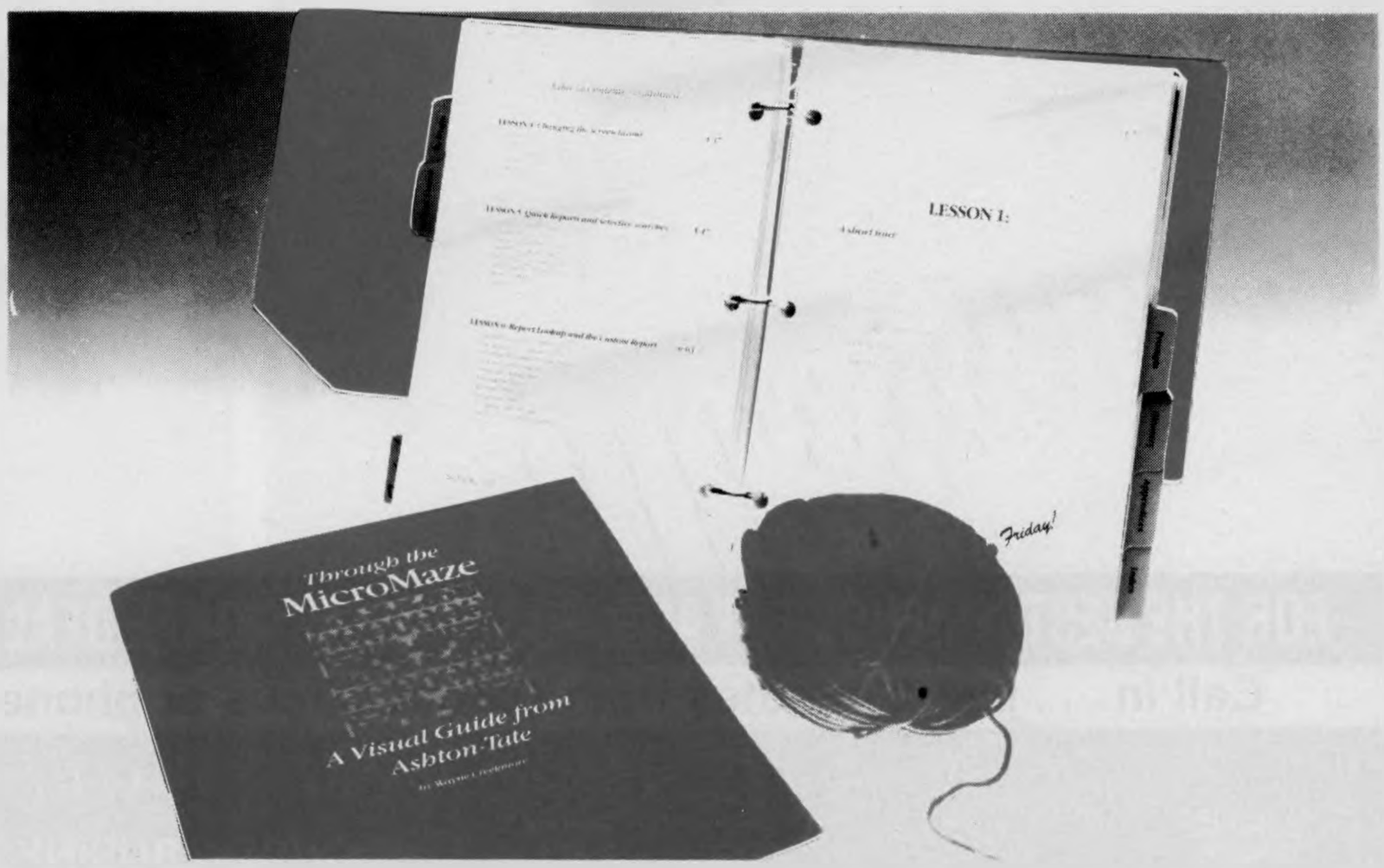

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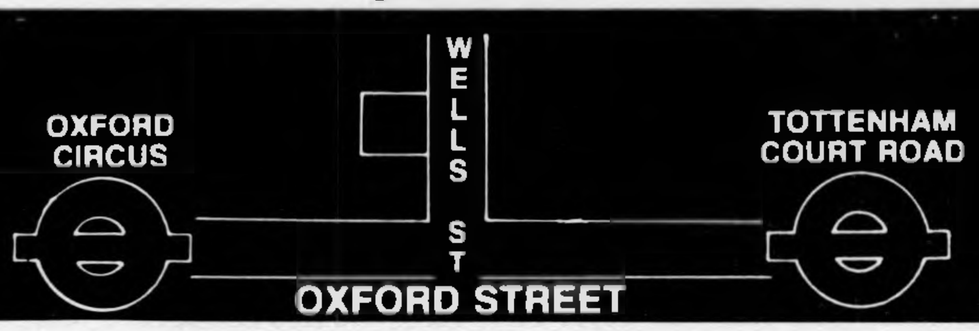

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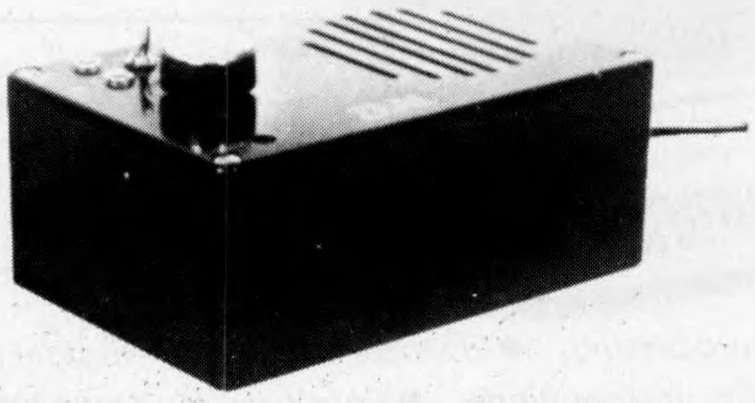

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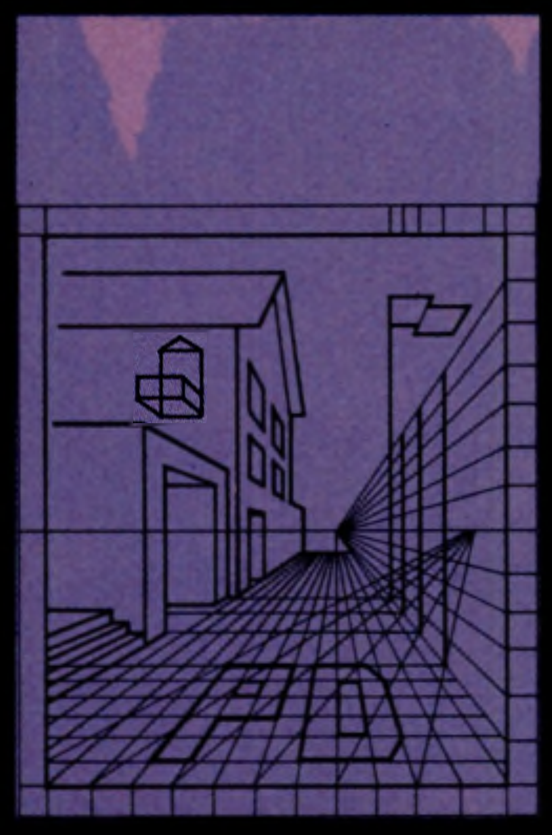



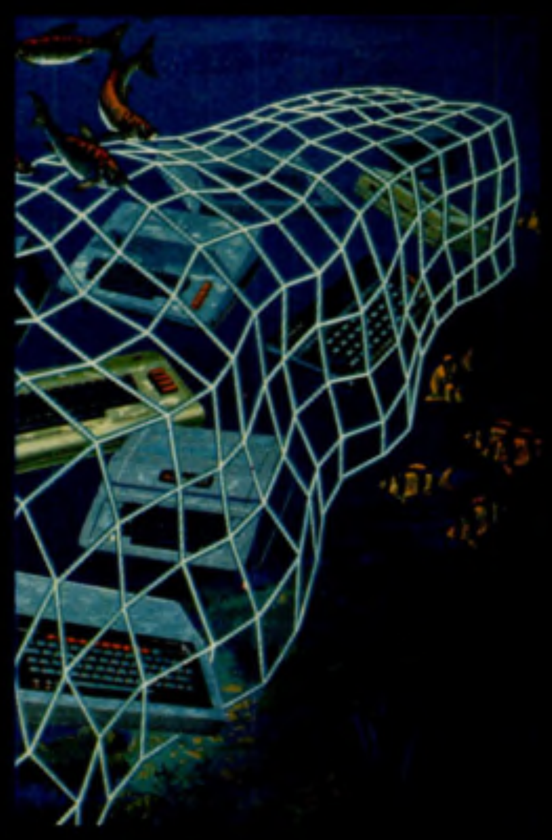

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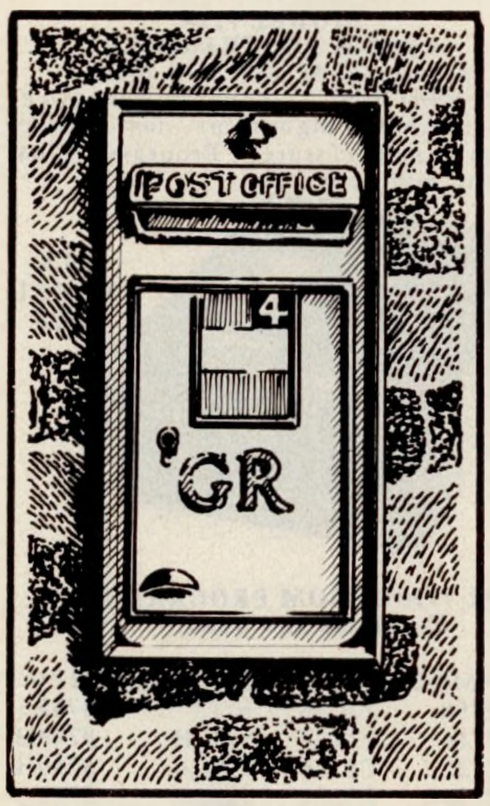

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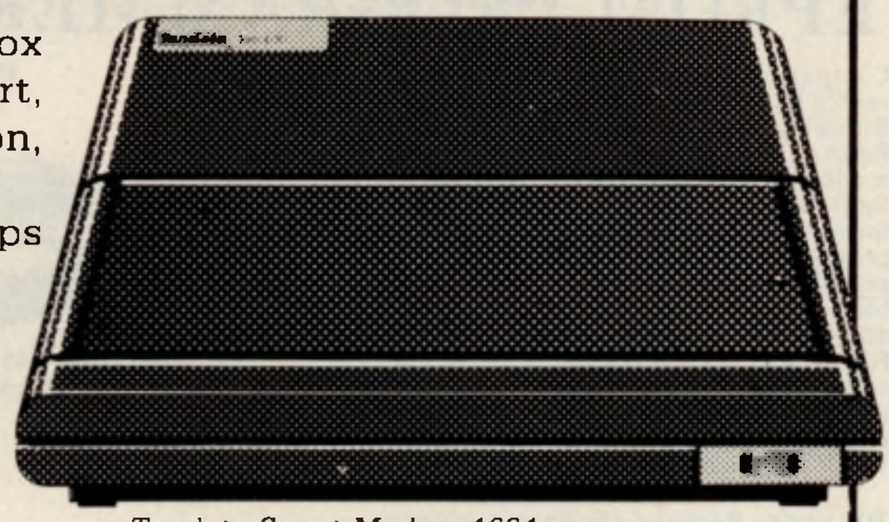

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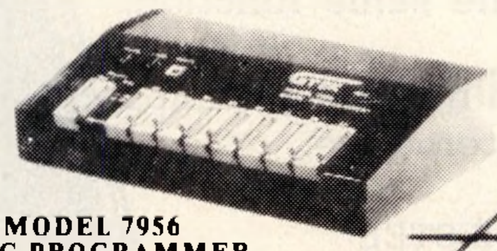

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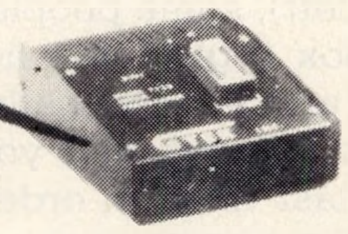

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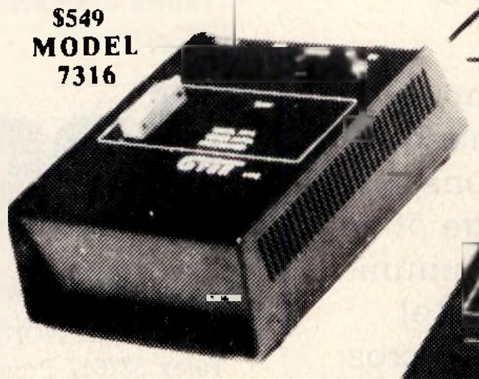

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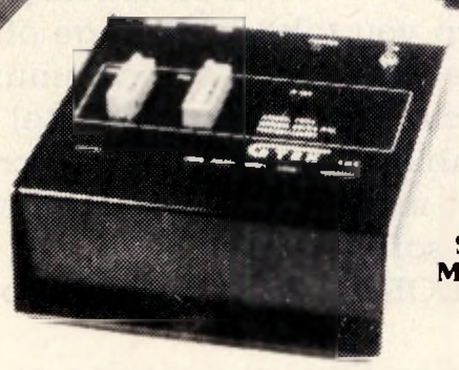

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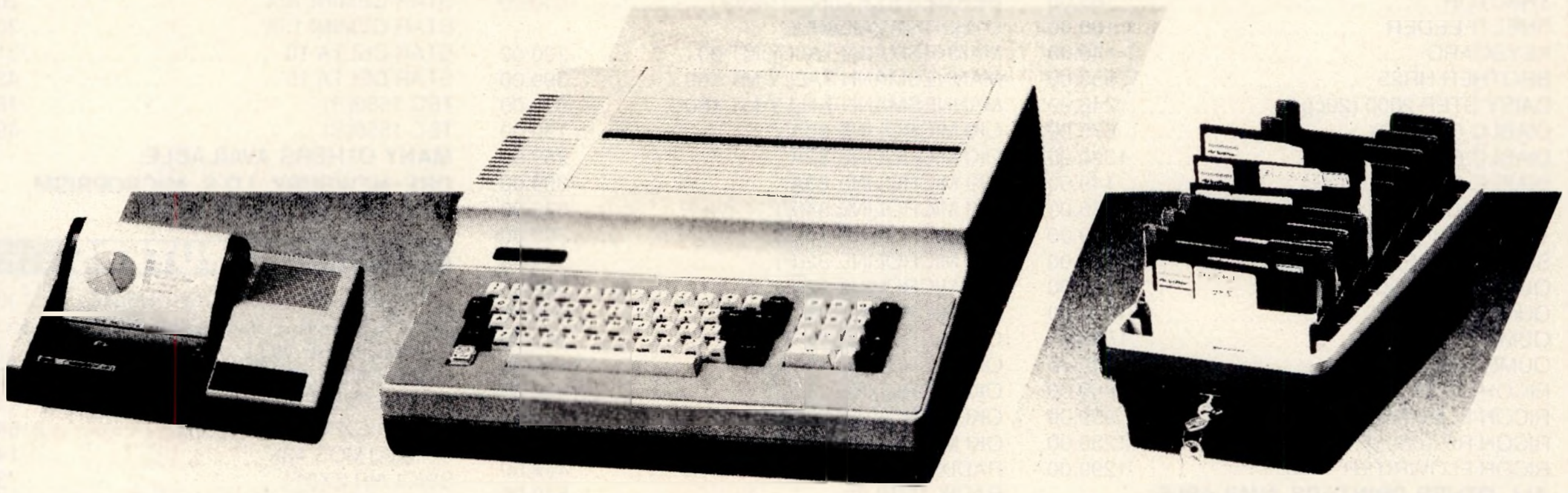

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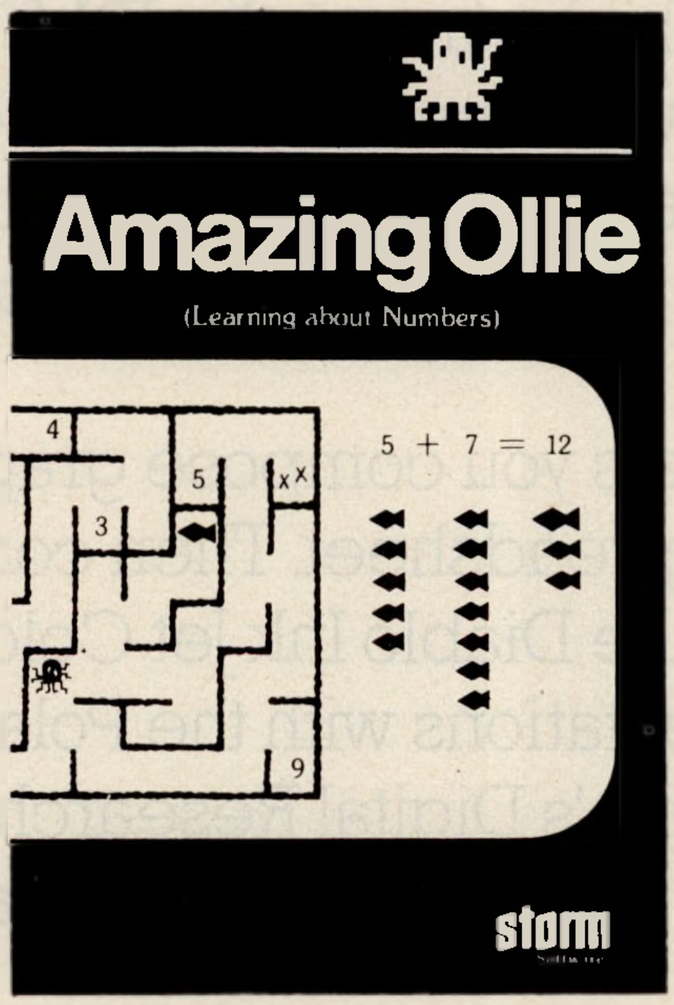

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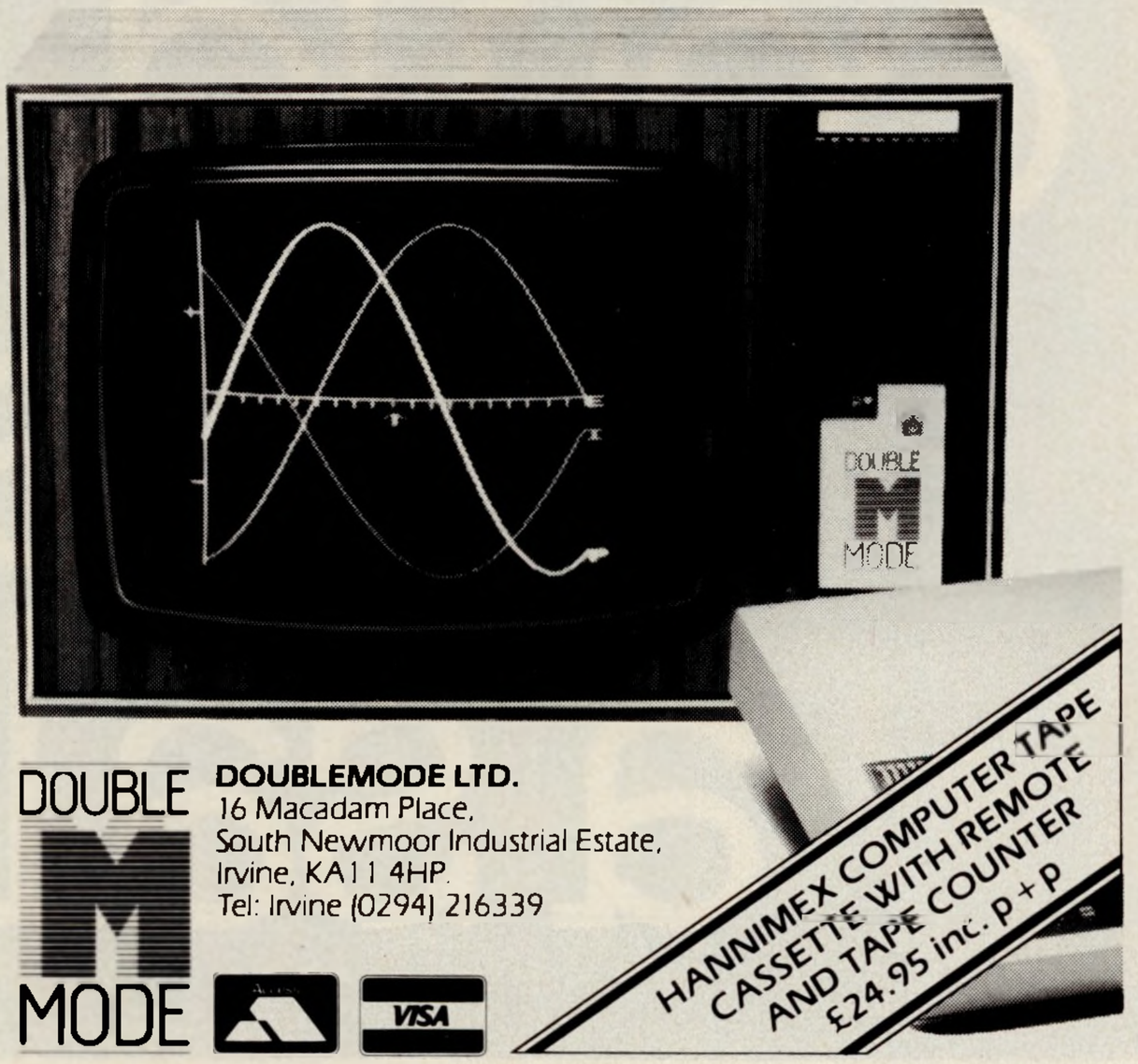

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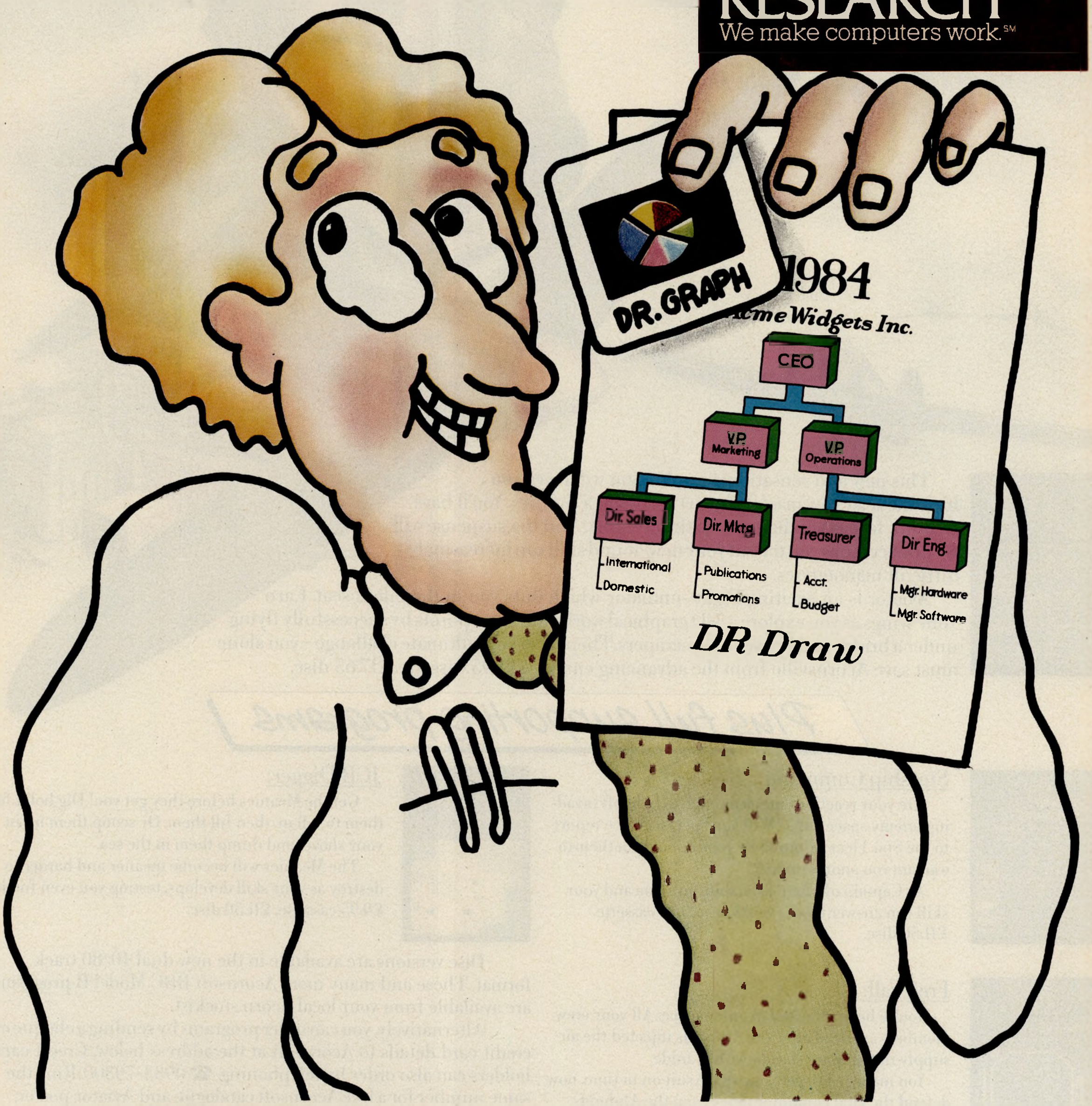

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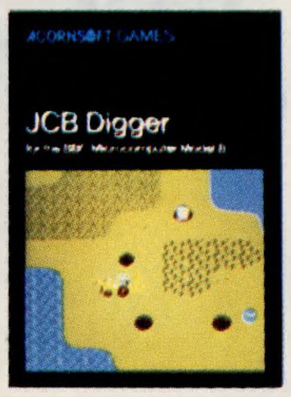

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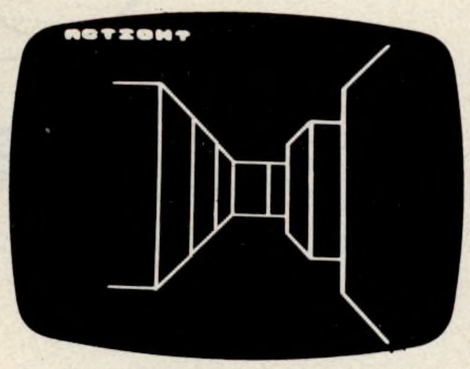

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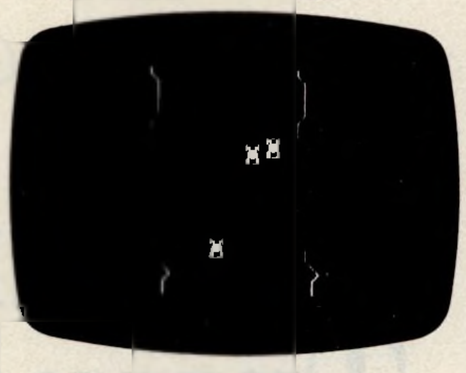

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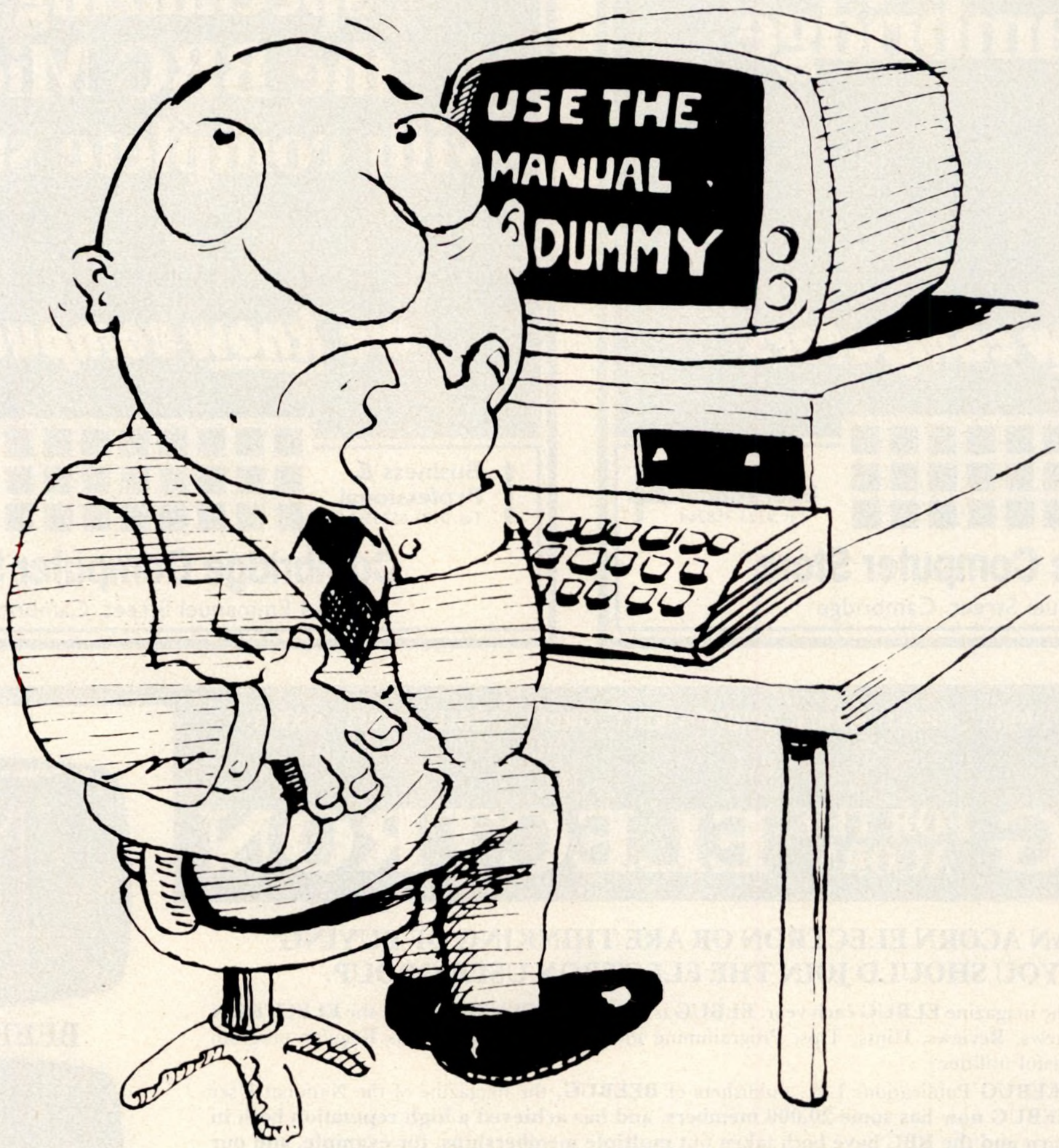

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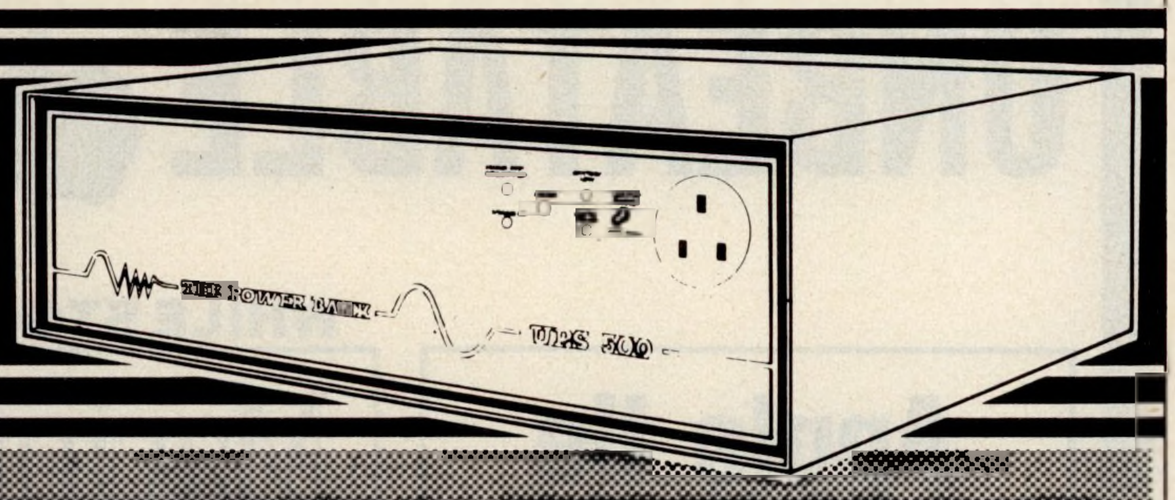

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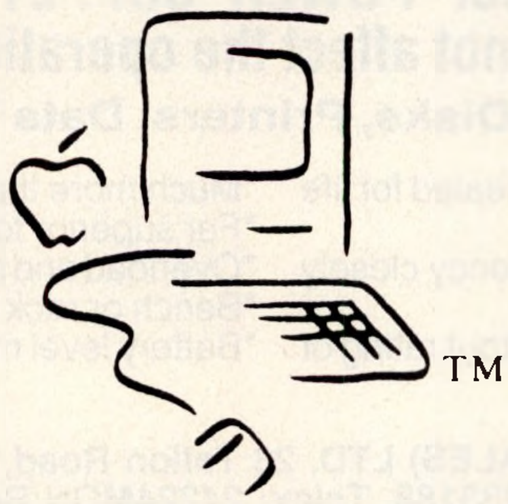

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With the vast amount of software running in so many widely differing fields, the Comart Communicator has already proved itself ideal for both software and hardware OEM's.

You'll find it at work ensuring that the field doctor in Kenya has the right medicines on board; the multiple caterer never runs out of buns and burgers and the dairy herd receives a balanced feed to achieve optimum milk yields. It's also doing jobs in a host of other areas — you'll find a few other examples at the foot of this page.

The most impressive thing about the Comart Communicator is it's sheer adaptability. Modular in concept, it can be expanded both inside and out. In under three years it has become a complete family of compatible, fully expandable microcomputer systems with a range of no less than 20 models — including single-user, multi-user and multi-processing systems. There's a choice of floppy and hard disk storage capacities with up to 1 megabyte of main memory plus cartridge tape and 8" diskette sub systems.

The Comart Communicator can support the widest possible range of operating systems including 8 & 16 bit versions of CP/M, MP/M, MS -DOS, CP/NOS, CP/NET and BOS together with IBM and ICL mainframe communication protocols.

Because every model can be readily configured, the Communicator affords a greater flexibility in the final choice of system, making it suitable for a multitude of specialist applications. And by making use of industry standard S100 Boards, existing and future models can be enhanced and upgraded to take account of new applications.

Such flexibility ensures that the Comart Communicator is unlikely to become obsolete. So software based on the Communicator can be planned with the certainty that the hardware will be around in the future, protecting your possibly substantial investment in development time.

The Communicator is renowned it's rugged reliability making it ideal for stressful environments. It's backed by a 12-month warranty and Comart have also met the stringent CCTA requirements. Also working for you are the resources and reputation of Comart as a major force in UK microcomputer development, with their innovative R & D team plus the support and back up of a speedy nationwide service organisation. And of course dealing with a British manufacturer you have direct access to our product support specialists for technical assistance.

What's more, you'll find the price of a Communicator very competitive. So if you're a system builder, OEM, software house or an end user looking for a solution for a specialist application, post the coupon for further details.

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The number of specialist software packages run on the Comart Communicator® surprised eve



COMART COMMUNICATOR SPECIFICATIONS

	CP100 Series Systems	CP1000 Series Systems
Microprocessors:	8 Bit Z80A (1 to 6)	16 Bit 8086
Memory:	64K-512K bytes	256K-1M byte
Storage:	390K or 790K byte diskettes 5M or 20M byte hard disks	390K or 790K byte diskettes 5M or 20M byte hard disks
Operating Systems:	CP/M, MP/M11 & CP/NET, Multi-processor, 1 to 5 users	CP/M86, MP/M86, MS-DOS, 1 to 8 users

Features common to both CP100 & CP1000 Series Systems

Keyboard/Display: 105 Key, detached 14" green screen, swivel/tilt,
Expansion: Internal – S100 cards, mainframe communications & protocols,
Expansion: External – stackable modules inc. cartridge tape & 8" floppy & hard disks.

CP/M, MP/M11, CP/M86, MP/M86 & CP/Net are trademarks of Digital Research Inc. Z80A is a trademark of Zilog Corp. MS-DOS is a trademark of Microsoft Corp. Comart and the Comart logo are trademarks of Comart Ltd.

The following are just a few of the more complex applications where the Communicator can be found at work:

Communications: Networking · Telex capture · Typesetting · Intelligent work stations · DDP · Software production.
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Factories: Interactive management systems · Production and stores control · Shop floor data collection · Automated assembly · Robotics · QA · CAD & CAM · Oil rig data monitoring.
Construction: Structural analysis · Timber fabrication · Glass sizing and cutting · Architects.
Transport: Fleet managment.
Education: Student admin. · Membership & subscriptions.
Government: Military systems · Administrative & catering · Project planning.

☐ I am an OEM/System Builder/Software House, please send me further details and a Communicator OEM pack.
☐ I am an end user interested in ..... (application) please put me in touch with my nearest Communicator OEM.

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PCW 5-84

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Spectravideo SV 328: Memory – 32K ROM expandable to 96K, 80K RAM expandable to 144K: Keyboard – full word processor type, 87 keys, 10 function keys, built in cursor control: Graphics – 16 colours, 256 x 192 high resolution graphics, 32 sprites: Sound – 3 channels, 8 octaves per channel: CP/M* compatibility – over 3000 existing software packages: Storage – cassette drive, 256K disc drive capacity: Suggested retail price – £262.

A full range of peripherals are also available.

** Which Micro Hardware Revue – Spectravideo SV-318

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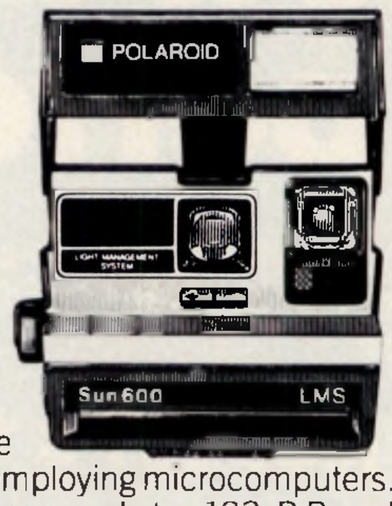
COMMUNICATORS GAVE GANG-NAIL A WORLD LEAD



"Switching from large mainframe computers and time-sharing to low cost, yet easily expandable, Communicator microcomputer systems from Comart, has given **Gang-Nail** a world lead in designing engineered timber components for the construction industry" says Paul Pinsky managing director of the UK Company which is part of the £1,100 million Redland Group. Gang-Nail initially employed computers for structural design, running their own suite of programs on a mainframe. For their micros, they have produced Concept 2000 which is employed for the design and manufacture of timber frame houses and has also been licensed out to other users. They have subsequently followed this up with Beta 2000 for Word Processing and Databases; Delta 2000 for roof tiling; and Gamma 2000 for house estimating. At Gang-Nail's UK HQ in Farnham, Surrey, 15 Communicator systems are used to develop advanced software and another 100 have been installed worldwide. "We no longer support any form of mainframe computing, everything is done on the Communicator which executes programs quickly and gives us infinitely more design power and flexibility than our competitors who are using mainframes or PETs. The Communicator is a nicely balanced reliable workhorse – we prefer the fireworks to come from the software" says Paul Pinsky. All Gang-Nail's Communicator systems have been sold and supported by The Byte Shop, Southampton.

PROGRAMMERS CORNER
Wide selection of programming languages, plus utilities and tools from Microsoft, Digital Research, Microfocus, Xitan and Pulsar, incl. Basic, Fortran, Cobol, Pascal, Assembler, C&PL1.

HOW MICROCOMPUTERS WERE AN INSTANT HIT WITH POLAROID



Polariod (UK) Ltd are a subsidiary of the famous U.S. company renowned the world over for their innovations in the field of instant photography. Their range of still cameras needs little introduction but the company has been busy recently with a revolutionary instant slide film as well as diversifications into computer graphic imaging for slides and photographs. The manufacturing plant in Dumbarton contacted the Byte Shop Glasgow to see if they could improve efficiency by employing microcomputers. IBM PCs were an obvious choice and these run Lotus 123, D Base II, Chartman and Friday for spreadsheet analysis, data base management and reporting/graphics respectively. Before microcomputers, such jobs were "Done manually or not at all". A key role for the PCs which is gathering momentum, is the transfer of financial and production data to the IBM mainframe. Overall benefits brought by the PCs include faster and more efficient working and importantly for an international company, improved presentation of reports with top quality graphs and pie charts.

At a glance Computer Checklist

	BBC Model B	Act Apricot	IBM PC/XT	Comart Communicator
Colour graphics	•		•	
Multi-user				•
Hard disk storage		•	•	•
Upgradeable				•
Expandable			•	•
Communications	•	•	•	•
Transportable	•	•		

THE BYTE SHOPS-W ON GETTING THE R

COMART COMMUNICATOR

With 15 models in the range, there is almost certainly a model which is exactly right for your requirements. Communicators are competitive with the best desk tops as a single user system, are perfect for companies planning to expand and for multi users, nothing else compares. Because Communicator's are modular, you can add-in extra capacity or add-on storage and back up units to keep pace with your future needs. There's a choice of 8 or 16 bit single and multi user systems with up to 1 megabyte of memory and 40 megabytes of data storage.

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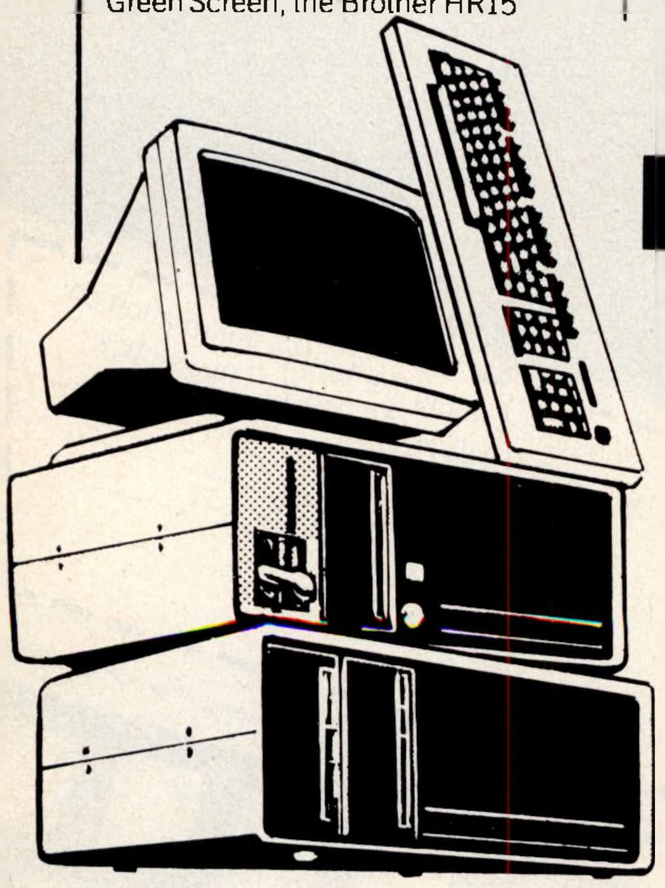

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COMPLETE SYSTEM FROM £2225 PER USER*

This allows each user to have their own dedicated Z80A processor and 64K bytes of memory. So two users, for example, could be running word processing, one accessing databases, one updating a sales ledger, while the fifth is preparing budgets using a financial planning package.

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ACT APRICOT



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* Subject to availability

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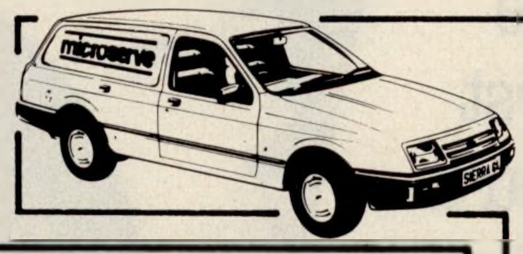

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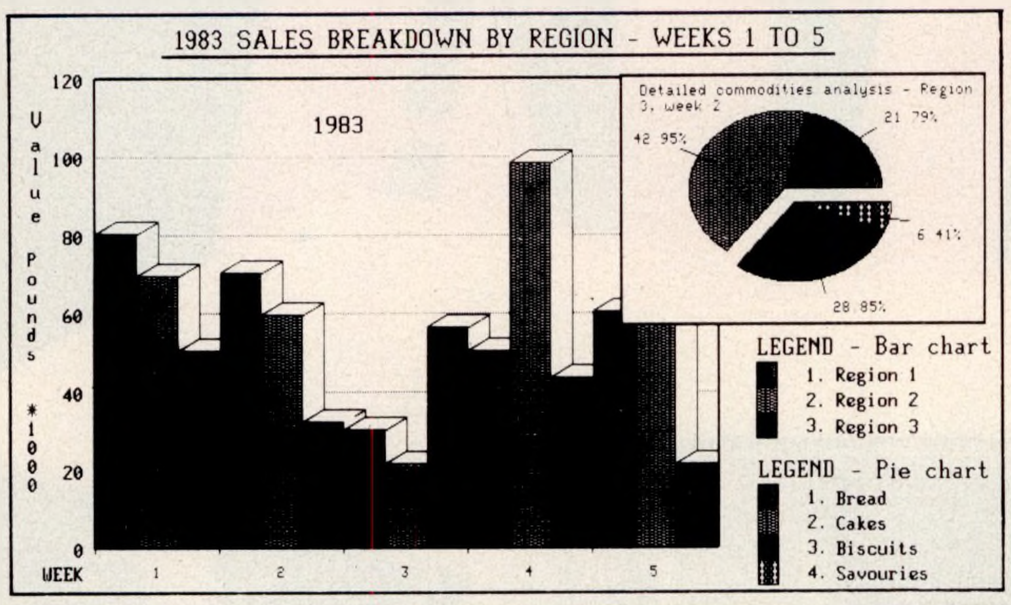

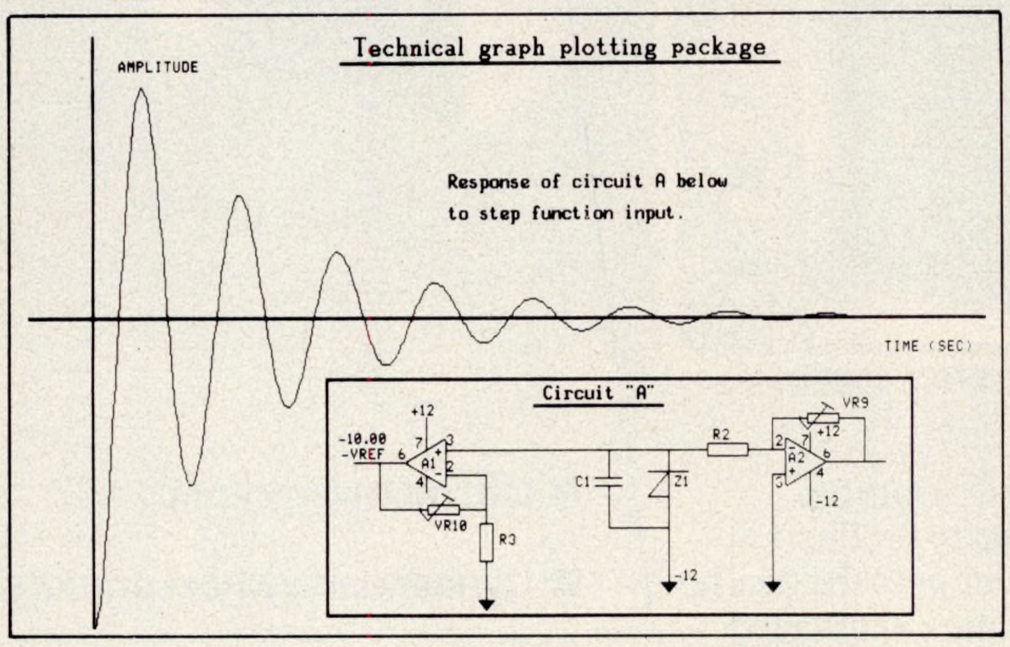

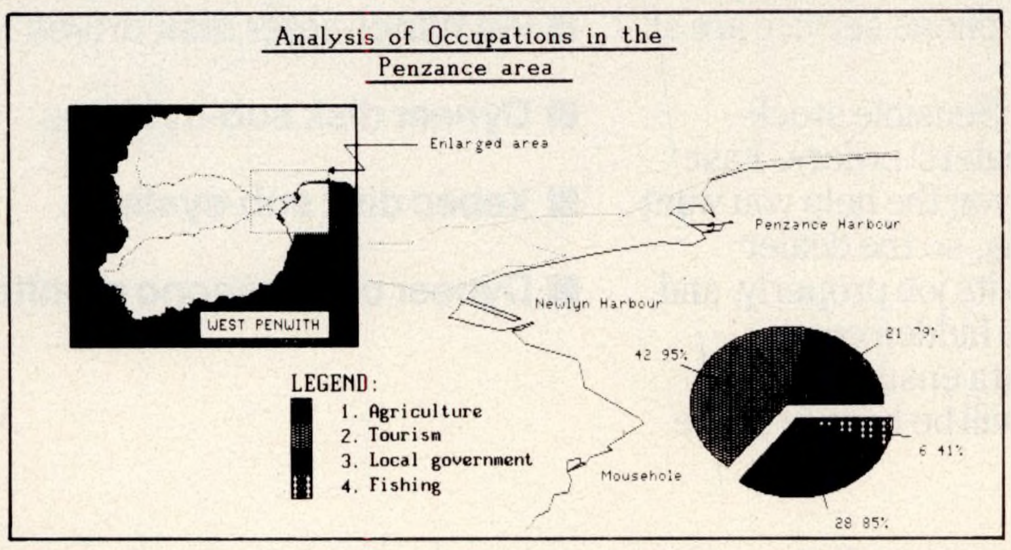

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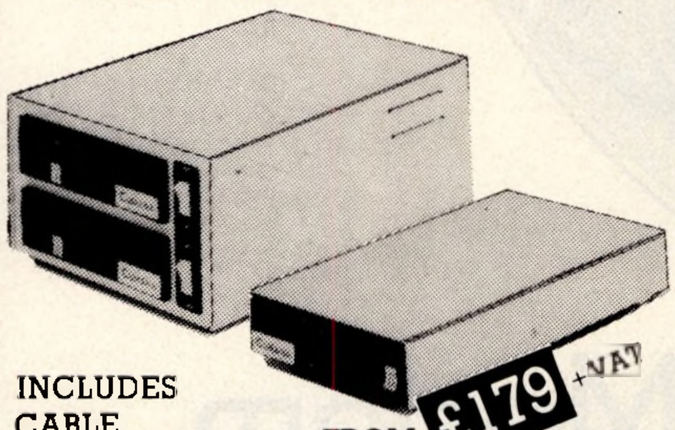

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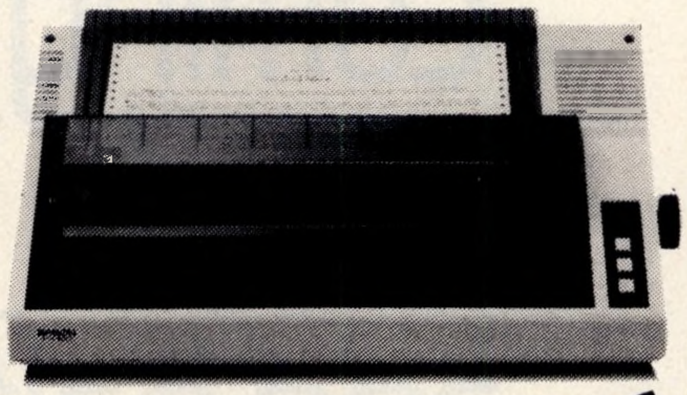

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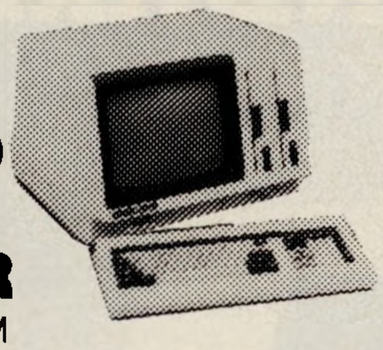

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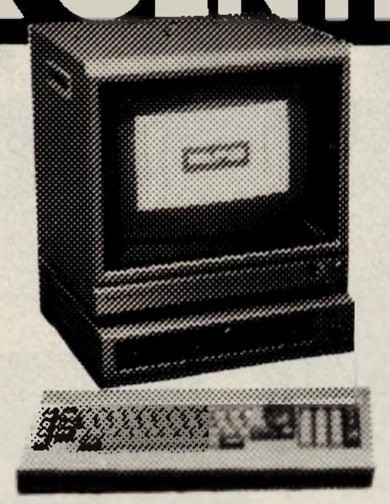

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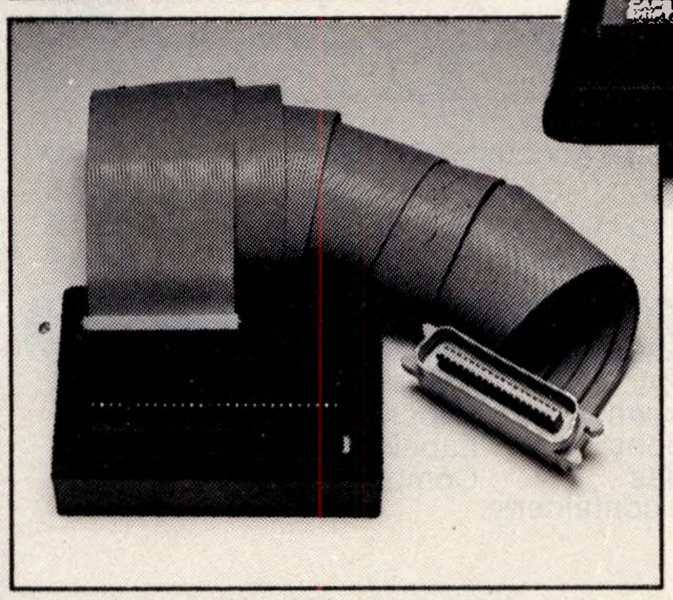

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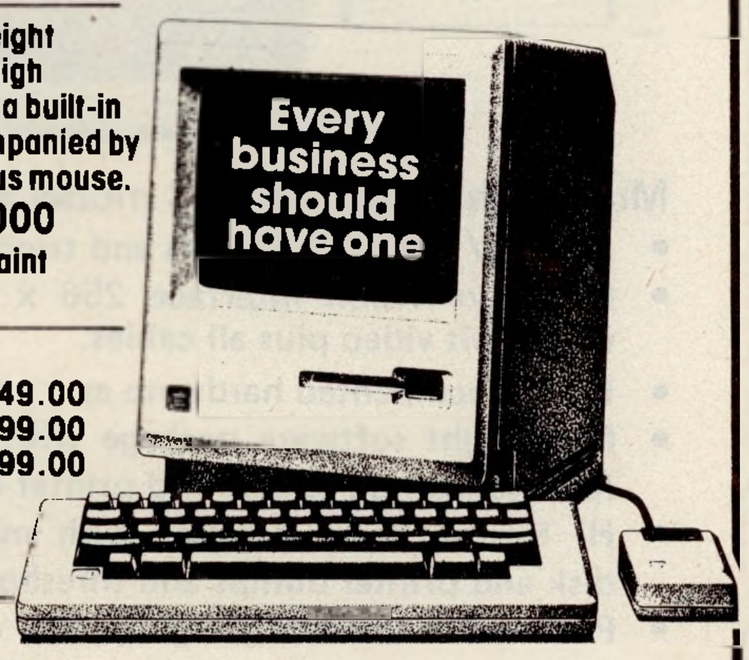

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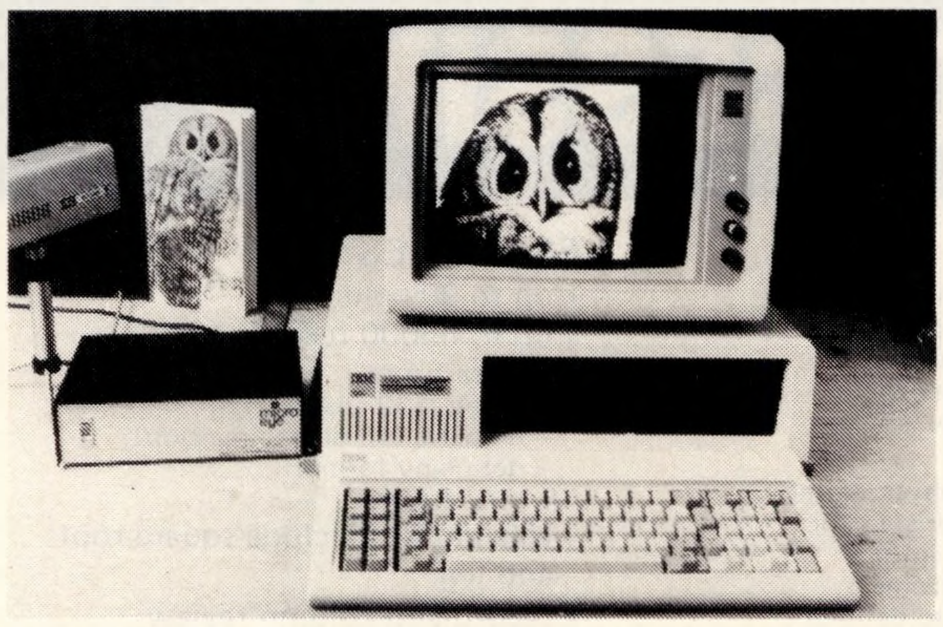

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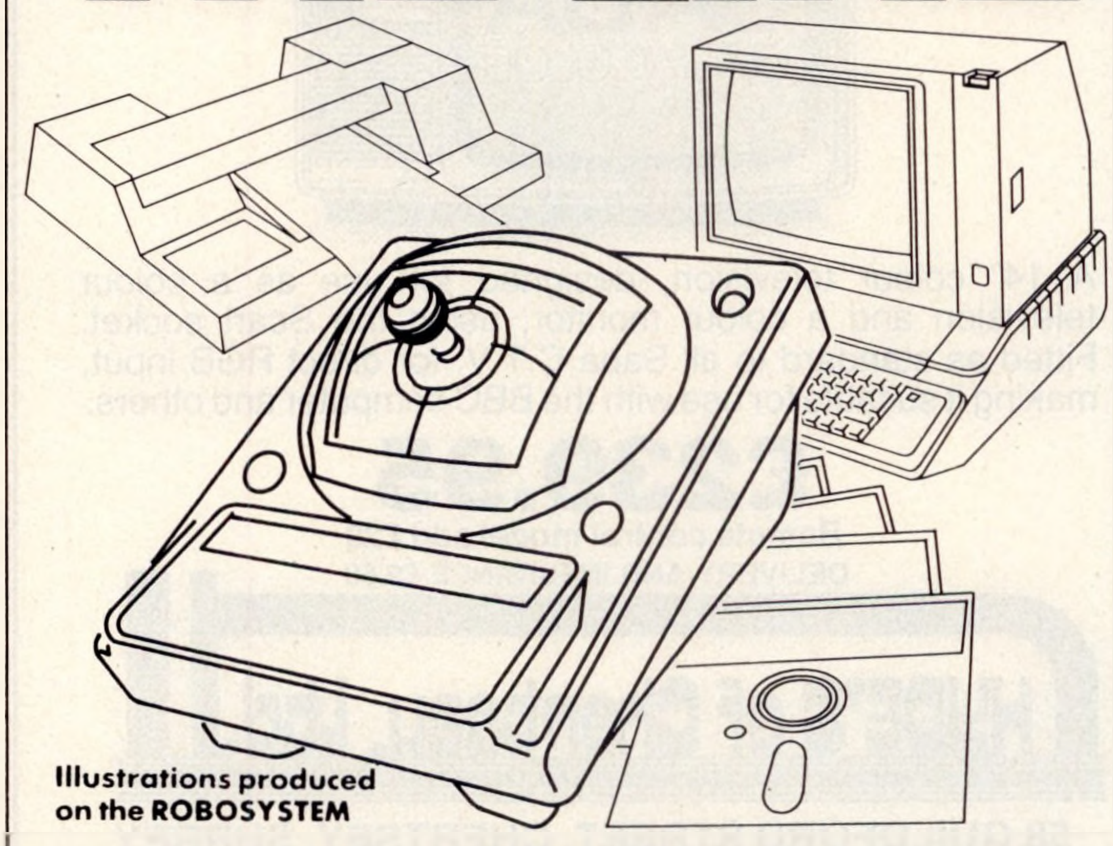

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VISION 80

Simply the most versatile 80 column card available for the Apple II+/IIe. Its 9x11 character set matrix is the largest and sharpest available giving a superb display. On-board communications software allows the Apple to act as a terminal with a wide range of databases and a number of different systems, including Apple to Apple communications.

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- Shift key does what you would expect it to do, and also has a shift lock facility and a visual LED shift lock indicator.
- Character set also includes twelve additional keys not normally available on the Apple keyboard.
- This card includes a built in softswitch ie no cable changes necessary when switching between 40/80 columns and graphics.
- The built in communications software driver gives your Apple the ability to be used as a true interactive intelligent terminal to mainframe computers or communications facilities. Fully compatible with CCS serial cards and Apple communication cards etc.
- The Vision 80 typeface is of an attractive appearance and is highly legible due to its large 9 x 11 character font.
- It supports all Applesoft commands including the text Window ie Home, Text, GR, HGR, HGR 2, Tab etc. It has inverse and normal display ie Highlight and Lowlight in CP/M and Pascal.
- It is possible to change the cursor character to either a block cursor or an underscore cursor. The speed of cursor blink can be altered and it is also possible to re-define the character set with your own personalised font.
- The card comes complete with demonstration utilities disc and is simple to install. It also includes a comprehensive users manual.
- For use with Apple II+, IIe. Supports DOS, Pascal and CP/M Software.

£185 + VAT

VISION AWII

For users of the Apple Writer II word processor, the software on this disc automatically carries out all necessary preboot procedures to display Apples word processor output in 80 column format.

£18 + VAT

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The Vision 128/256 Ramcard is an inexpensive means of providing up to 256 Kilobytes of additional RAM main storage for the Apple II, II+, IIe. The card can be used as a fast scratchpad, supplementing the local storage of data arrays for application programs that can utilise this facility directly (eg. Visicalc etc), alternatively with appropriate utility software support, the card can be 'masked' to appear as a fast disc storage unit.
The Vision memory expansion is available as a basic 128K card which can be upgraded to 256K RAM as required. The card, which is fully compatible with the Vision 80, is fully buffered allowing lower power consumption and giving greater reliability. The card also features 6 L.E.D. indicators to indicate the current bank selected and read/write enabled.

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VISION VCE

This preboot disc for use with the Vision 80 allows VisiCalc users to see a full 80 columns displayed on the monitor, it also makes use of the extra memory available in the Vision 128 (upto 143K in all).

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VISION COMBO PACK

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The MTX Series described; straight from the author's mouth

MANUAL

The first section (of the manual) is a basic tutorial. The grass roots information is here and I could not find any major mistakes. The second part is on Noddy giving a good guide as to how it can be written. . . . The third and fourth sections are on graphics and sound. Both are quite detailed and easy to follow. The fifth section is on how to interface Assembler to Basic.
Personal Computing Today Feb 84.

The provisional manual, which runs to some 250 A4 size pages, has a wealth of detail for the machine-code specialist.
Electronics and Computing Monthly.

INTEGRATED INTERACTIVE SOFTWARE

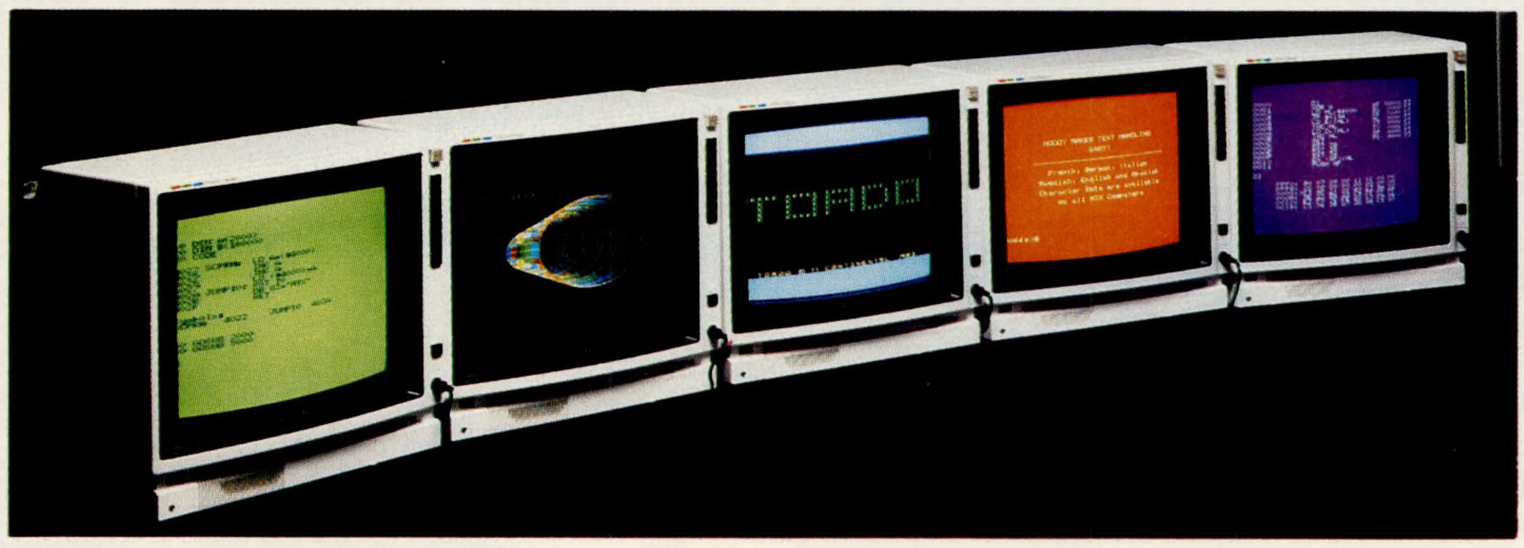
The MTX ROM has been designed to allow the maximum interaction between components of the software. A single program can be written which uses NODDY to display text and graphics, and a BASIC control program which calls routines written in assembly code. This is a feature of future generation computers not available on any other micro.

BASIC

The Basic is fast and accurate, all the calculations being done in floating point maths, so that you don't lose accuracy to gain speed.
Personal Computing Today Feb 84.

The latest addition to the Memotech range DMX80 Matrix Printer – 80 characters per second print speed, eight character formats, dot addressable graphics, **£295.00 including VAT.**





Integrated Software – a five to one advantage. Assembler/Disassembler, High resolution Graphics, Arcade style games, Noddy for easy text handling and Front Panel for testing and debugging machine code.

NODDY

A language new to me called Noddy is included in the MTX which is designed to make text handling easy, especially for beginners.
Hobby Electronics.

Also provided is the easy to use beginner's language (Noddy) and a child oriented learning language Logo.
Practical Computing Dec 83.

(Noddy has only 11 commands) that need to be mastered before some quite complex question-and-answer-type programs can be written.
Your Computer Nov 83.

Noddy 's . . . main use is for displaying text and I can see applications in the computer assisted learning (CAL) field. Writing in Noddy is like a mixture of Logo and Forth.
Personal Computing Today Feb 84.

ASSEMBLER/DISASSEMBLER

The Assembler can be accessed through BASIC. When used in conjunction with the PANEL it enables the programmer to single step through and test machine code programs. This is not new to computing, but it is to a home micro.

As well as being able to modify and disassemble sections of code, you can set break points, examine and alter register values, and even single step through code. I hope other Z80 micro manufacturers (particularly in the Cambridge direction) take note of these debugging aids.
Popular Computing Weekly Nov 83.

The Assembler is called from Basic, and it assembles the code in situ, as part of the Basic listing.
Hobby Electronics.

Z80 BOARD

The MTX Series is a more powerful tool for education than the 6502 because it produces a more powerful assembler, allows the PANEL function to be used, and enables integrated software to be written.

RML's 450Z has a (PANEL) function but that is a computer which costs considerably more than the MTX 500.
Hobby Electronics.

FULLY INTEGRATED AND EXTENDED GRAPHICS

The only aspect of the series where extensions to standard language are allowed is in the most comprehensive and integrated graphics available on a home micro.

32 Sprites are supported either 8 × 8 or 16 × 16. They are easy to use and define and do not use extra memory as in the . . . because they have their own area of RAM.
Personal Computing Today Feb 84.

Graphics are very easy to create and manipulate, even for beginners.
Which Micro Jan 84.



MTX512 plus twin 5 1/4" disc **FDX**. A CP/M based business system – **£1245 inc VAT.**

SOUND

The simplification of the sound commands for ease of programming has in no way compromised the quality of the sound produced.

Sound is of great importance for use in games but on many microcomputers it is inadequate. Not so with the MTX . . .
Your Computer Nov 83.

As well as good graphics capability the MTX boasts the same sound chip as the BBC micro – the Texas 76489. It has three tone channels and one noise channel, and is easily controlled from Basic. Volume and frequency can also be controlled, using a much easier method than the 14 parameters needed by the BBC.
Popular Computing Weekly Nov 83.

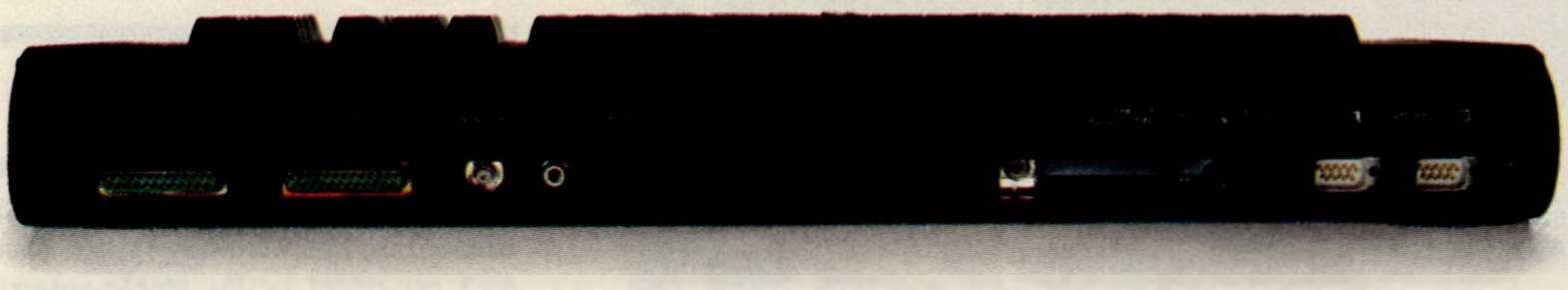
The commands are sufficiently complex to enable the computer to be used as a synthesizer.
Electronics and Computing Monthly.

CP/M OPERATING SYSTEM

The Series is designed to run under the CP/M operating system. This is the Disc Filing System used on the vast majority of microcomputers in business. Since a program written on one CP/M machine can be transferred and run on almost any other, this makes available 15,000 CP/M based business programs. The powerful LINK program can give access to any device operating under CP/M. With its excellent software support and because of it's modular nature, the series is a cost-effective and efficient entry to serious business and educational computing.

FULL-TRAVEL KEYBOARD

It has a professional quality keyboard. This and its elegant styling make it suitable for word processing and business use.
Your Computer Nov 83.



Input/Output Monitor, Hi-Fi, Power, TV, Centronics, Cassette Mic and Ear, and two Joystick ports all come as standard; the twin RS232 ports are available as expansions.

HARDWARE

Inside the case is what one comes to expect from Memotech – a very neat PCB that holds all the components including the main chips – namely a Z80A processor and TMS 9929 graphics chips as well as about 30 others.
Popular Computing Weekly Nov 83.

If you are familiar with the ZX81 peripherals that Memotech also make you will know that the company has an eye for good design and does not skimp on materials it uses.
Electronics and Computing Monthly.

NODE RING

MTX computers can operate together without expensive network systems. Units linked via the ring can share software peripherals and communicate with each other. Many other makes of computer can be interfaced with the ring as terminals.

EDUCATIONAL USAGE

There will be many people who have seen a front panel display on the 380Z computer in secondary schools or colleges, and the MTX panel is very similar.
Hobby Electronics.

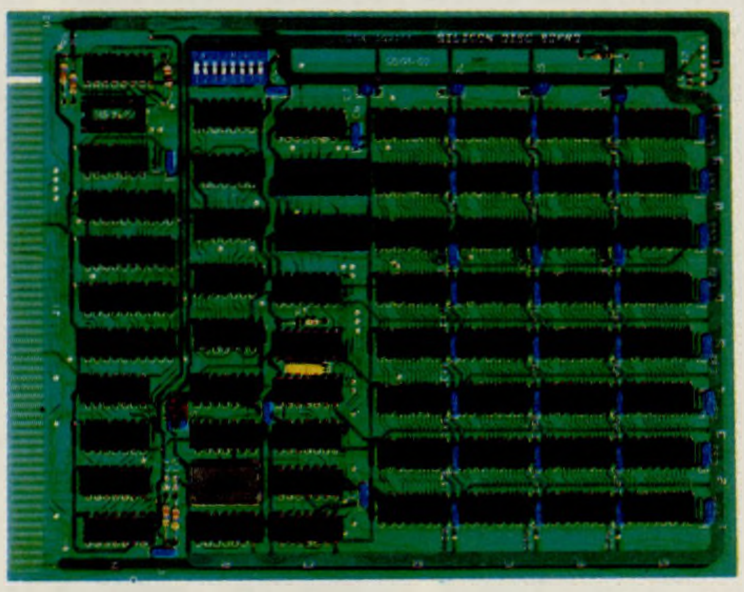
The new language Noddy and the Logo type Turtle Graphic commands would appeal particularly to the growing education market.
Your Computer Nov 83.

Applications are obviously going to suggest themselves in areas of the school curriculum, the fast-training of personnel in commerce, and in adventure-game writing.
Hobby Electronics.

The MTX expansion potential is well thought out. The key to both the MTX Ring system and to the Disc Drive systems is the communications (RS232) board mentioned earlier.
Electronics and Computing Monthly.

UPGRADABILITY

The MTX 500/512 is part of an existing range of products which can be bought separately and integrated into a single powerful system, now.



Silicon Disc RAM Board 256K fast access RAM

There is plenty of room for expansion with the MTX and Memotech have planned a progression up to their small business machine with 80 column display (instead of the standard 40 × 24) Floppy discs, Silicon (or RAM) discs, and a hard disc under development.
Personal Computing Today Feb 84.

There are a multitude of sockets along the back consisting of two Joystick sockets, cassette connections, Centronics printer circuit, aerial socket, power socket and audio and video output. There is also provision for two RS232 sockets . . .
Popular Computing Weekly Nov 83.

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KILOPEDE

Eliminate **mushrooms** and the descending segmented **Kilopede** to gain bonus points – avoid killer **crabs**, **fleas**, **spiders** and **jellyfish** which chase you across multiple levels of increasing difficulty.

SUPER MINEFIELD

The object of the game is to get from one side of the minefield to the other without being **blown up**. You only get one life so be careful – not all the mines are visible. The only way you can tell how many mines are nearby is by looking at the **mine detector** in the top right hand corner of the screen.

BLOBBO

Run at high speed around the maze collecting **treasure** and **fruit** worth bonus points – but don't get caught by the **Blobbo-eaters**! Tactical dodging must be employed to avoid them. If you're caught or step on a skull and crossbones you lose one of your three lives.

KNUCKLES

Move **Knuckles** around his maze, using a joystick to kick **Roks** and **Magic Squares**. The object is to line up the Magic Squares, using the fire key, and so advance to the next level, gaining a level bonus.

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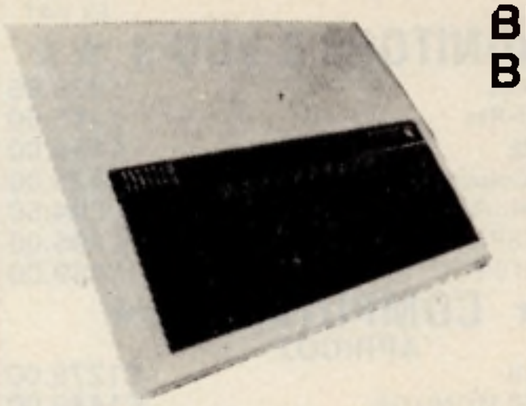

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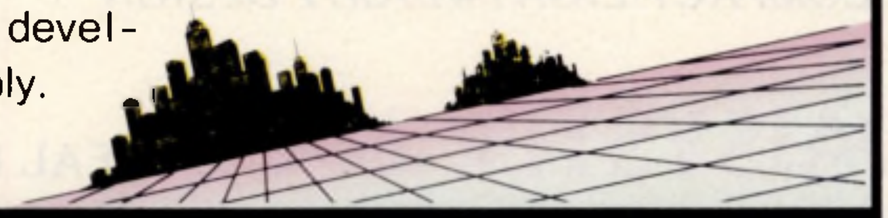

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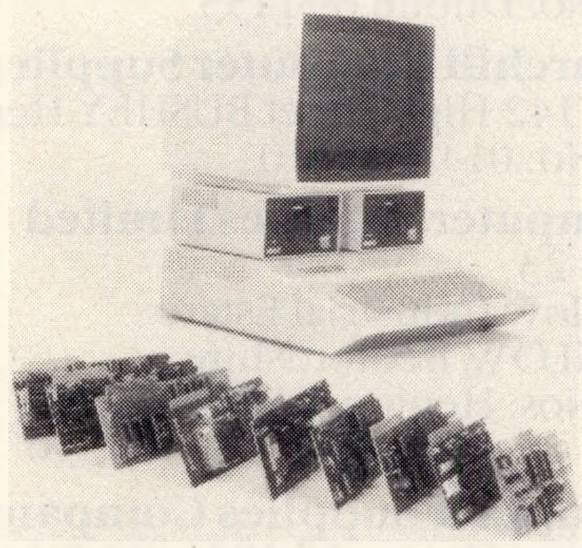

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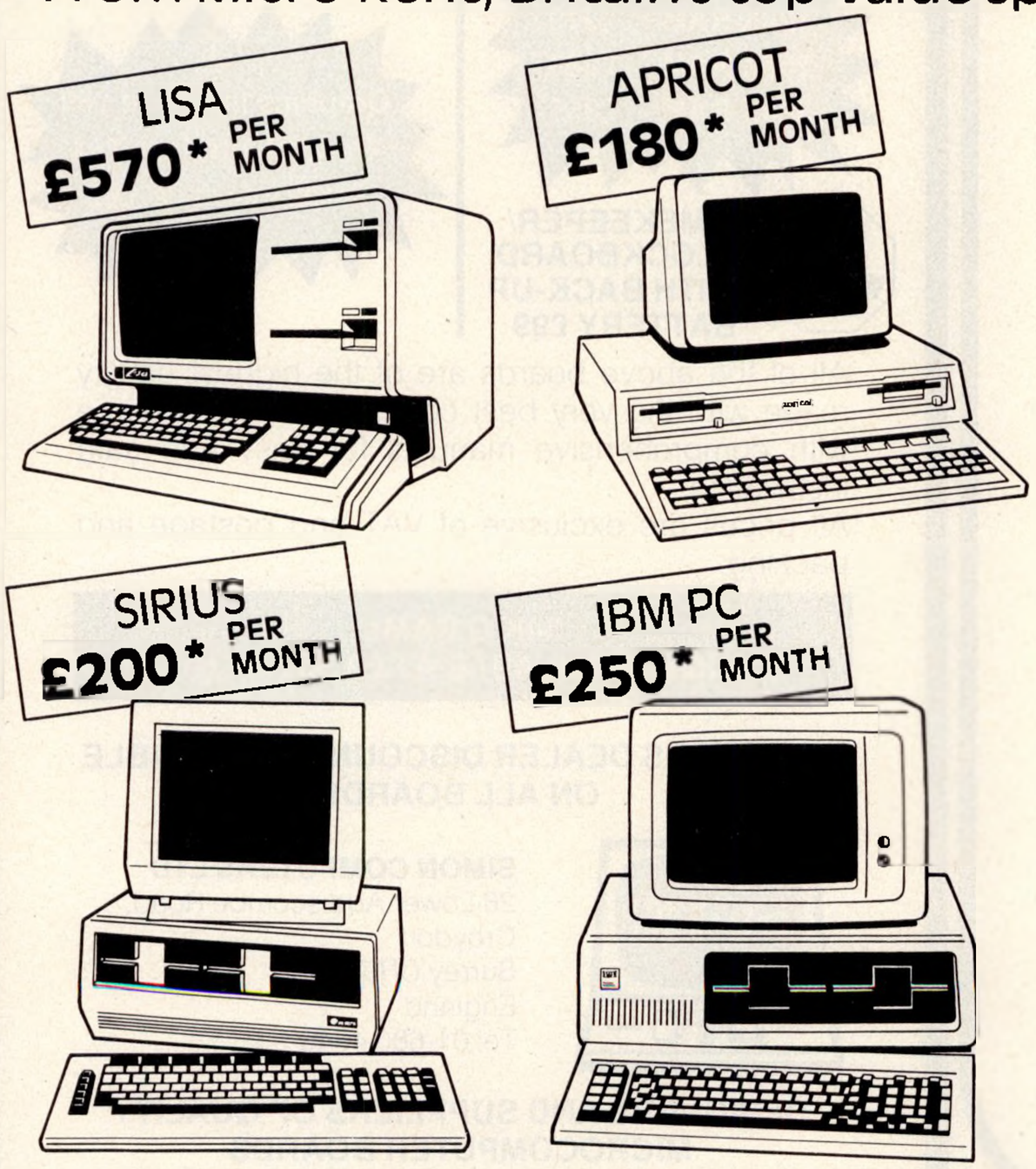

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1VID-003	Videx Enhancer II	83 00	95 45
1VID-010	Videx Inverse Eprom	18 45	21 21
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1VIS-001	Vision 80 (inc softswitch & inverse)	185 00	212 75
1TYT-002	VC Expand 80	47 00	54 05
1VER-001	Super Expander 80 2	76 00	87 40

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1MIC-002	Microvitec Colour Monitor	265 00	304 75
1MIC-001	Microvitec Colour Card (for above)	35 00	40 25
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1SYN-013	Global Program Line Editor (supports 80 cols)	39 00	44 85
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1SWD-009	Speedstar (assembles 12000 lines/min)	63 50	73 02
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1BEA-009	Type Faces (req Apple Mechanic)	12 30	14 14
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1APL-009	Apple Super Pilot	122 50	140 87
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1SFT-002	Forth II	42 00	48 30
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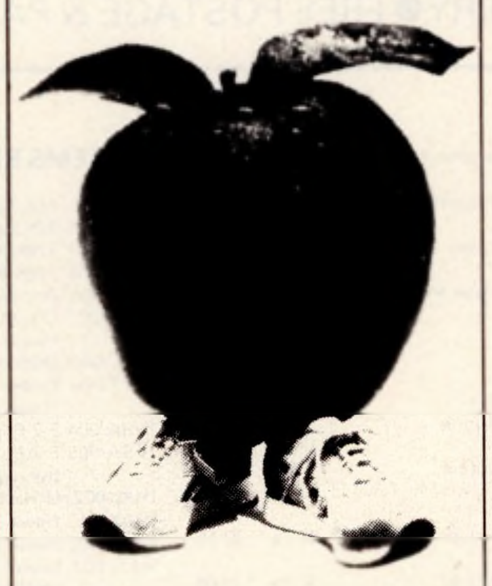

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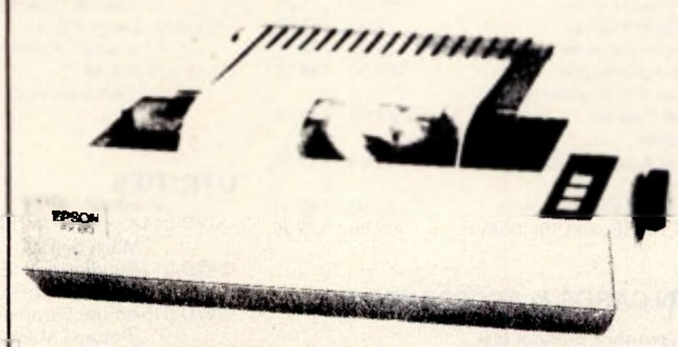

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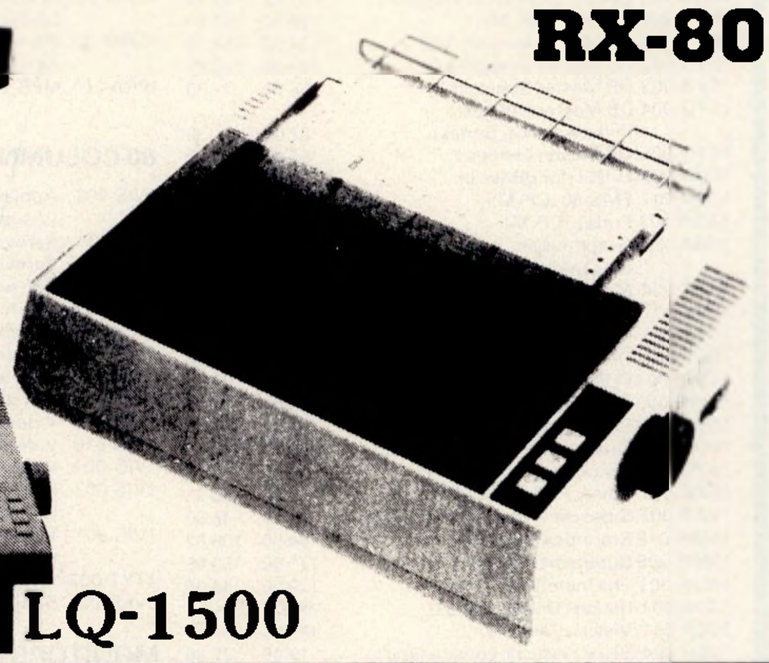

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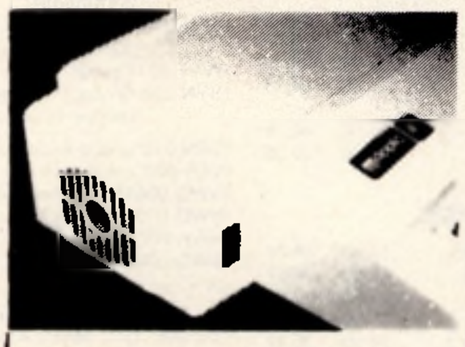

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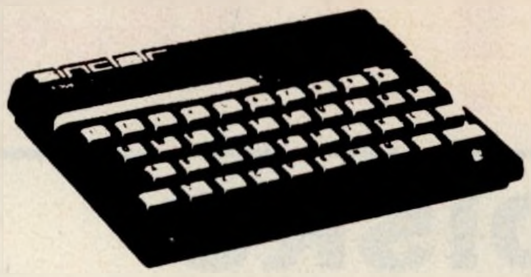

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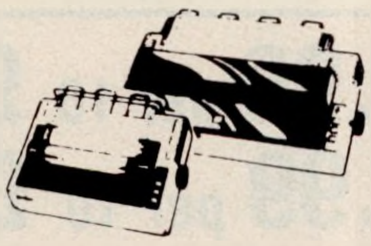

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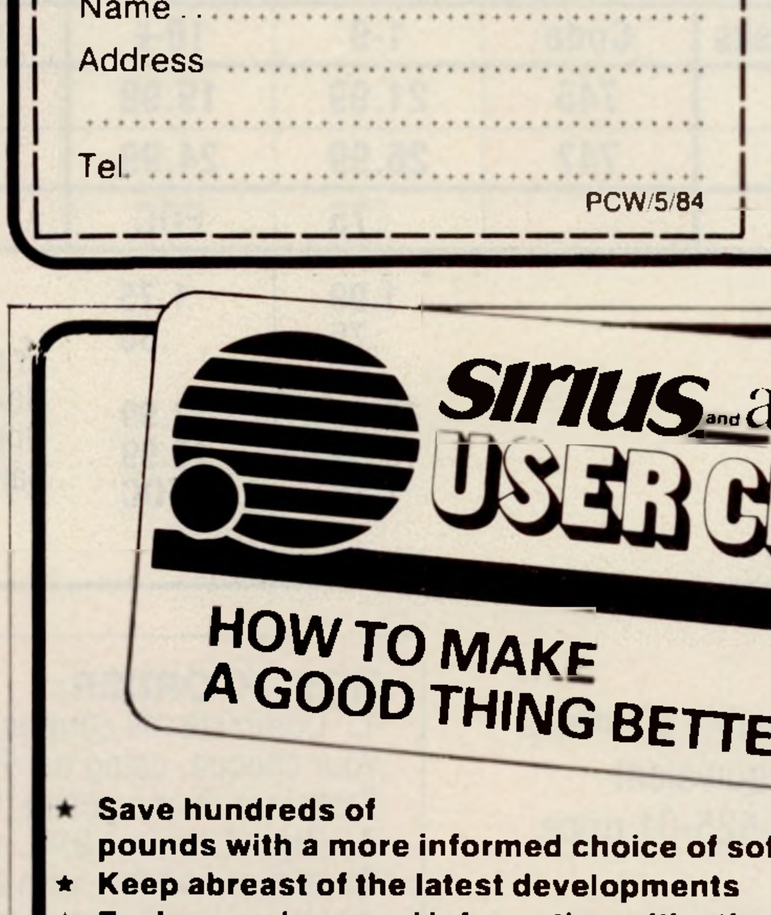

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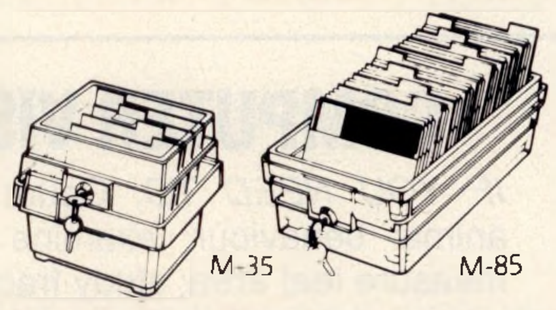

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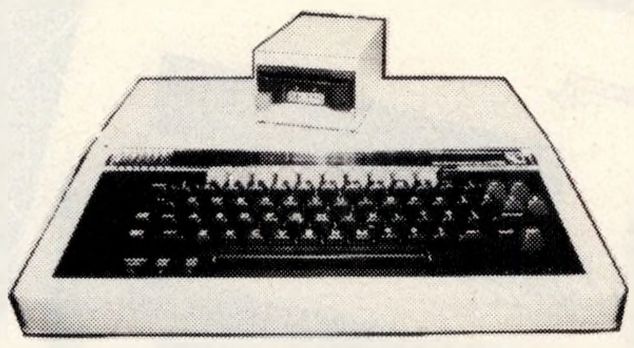

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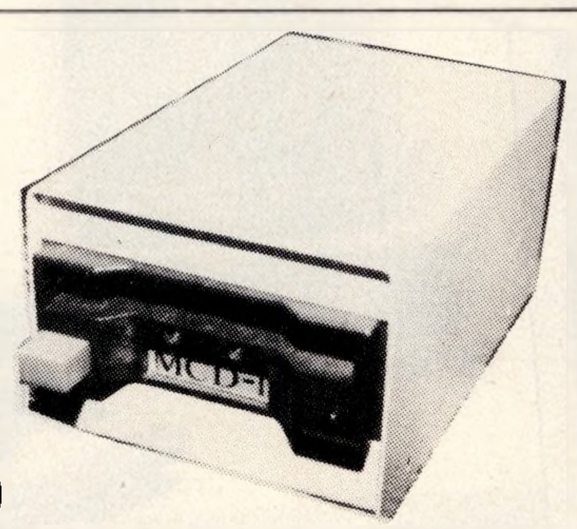

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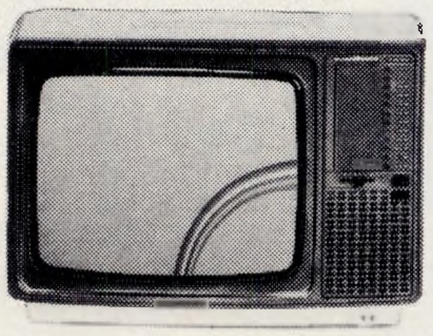

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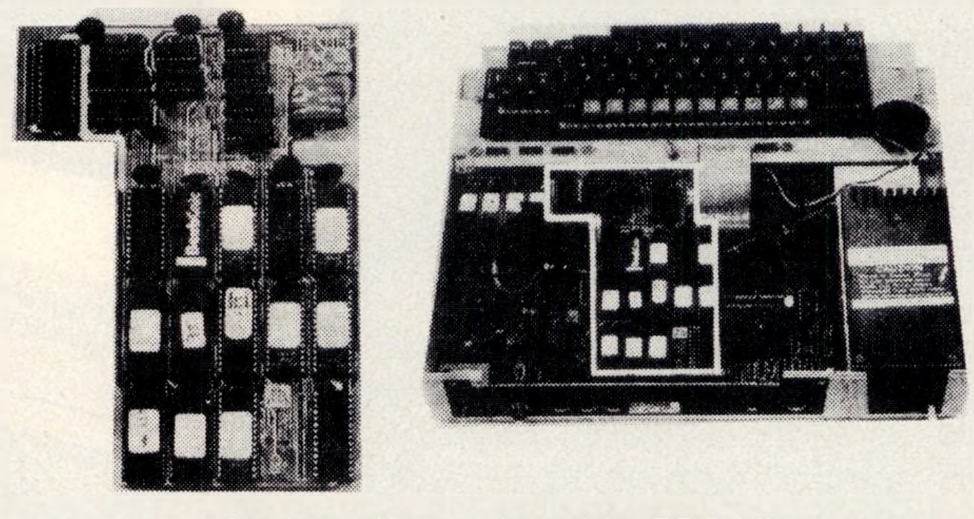

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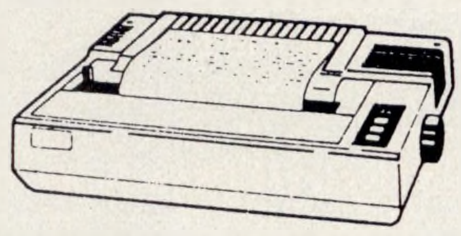

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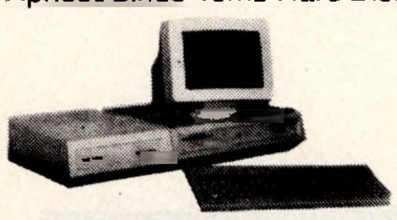



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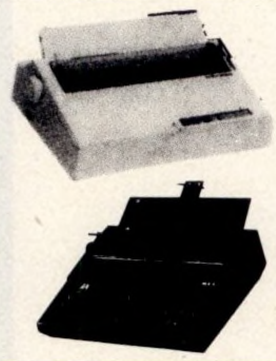

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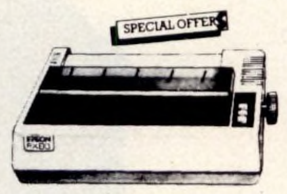

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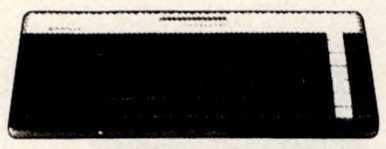

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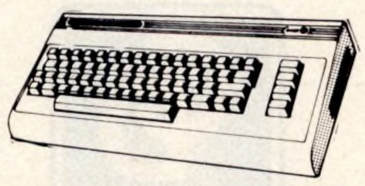

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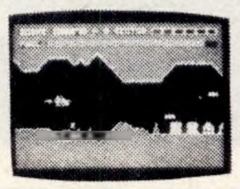

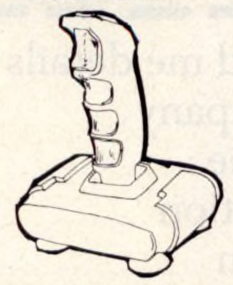

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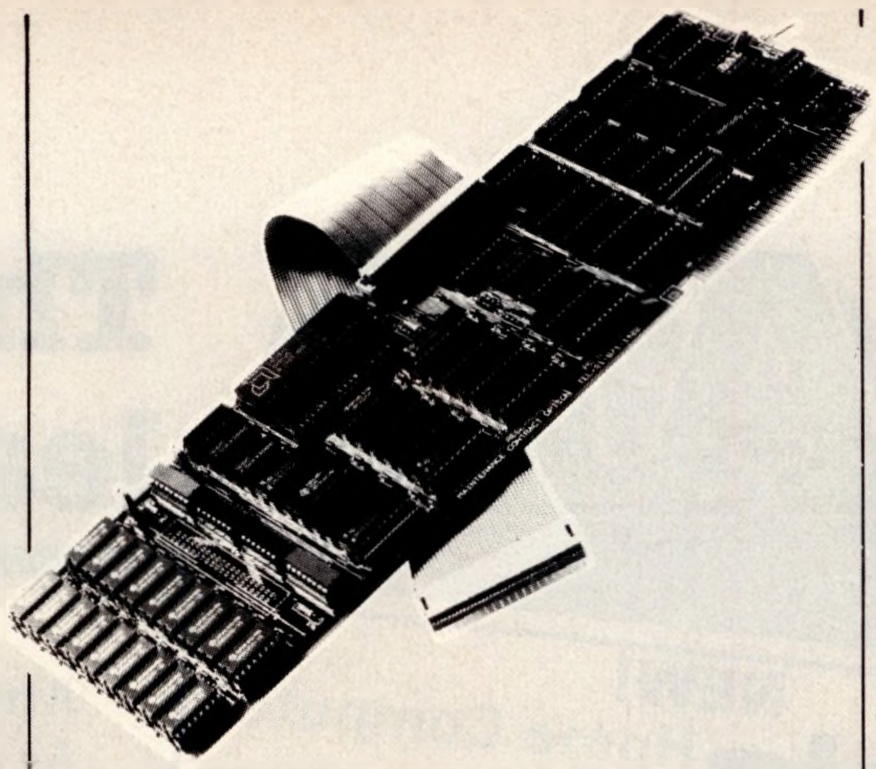

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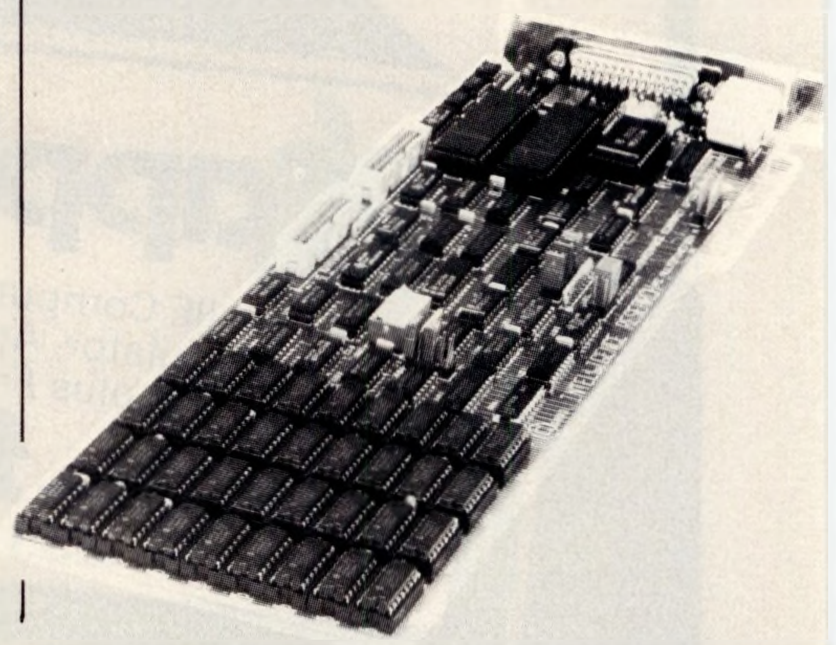

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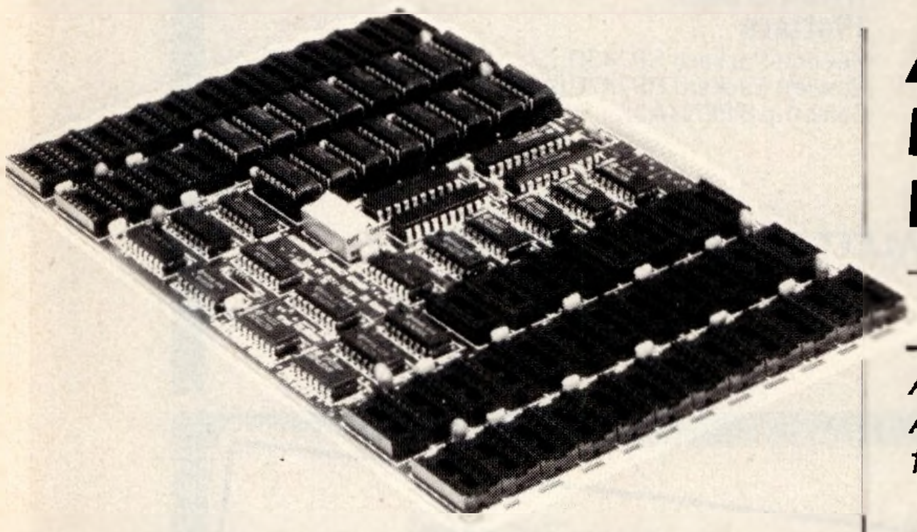

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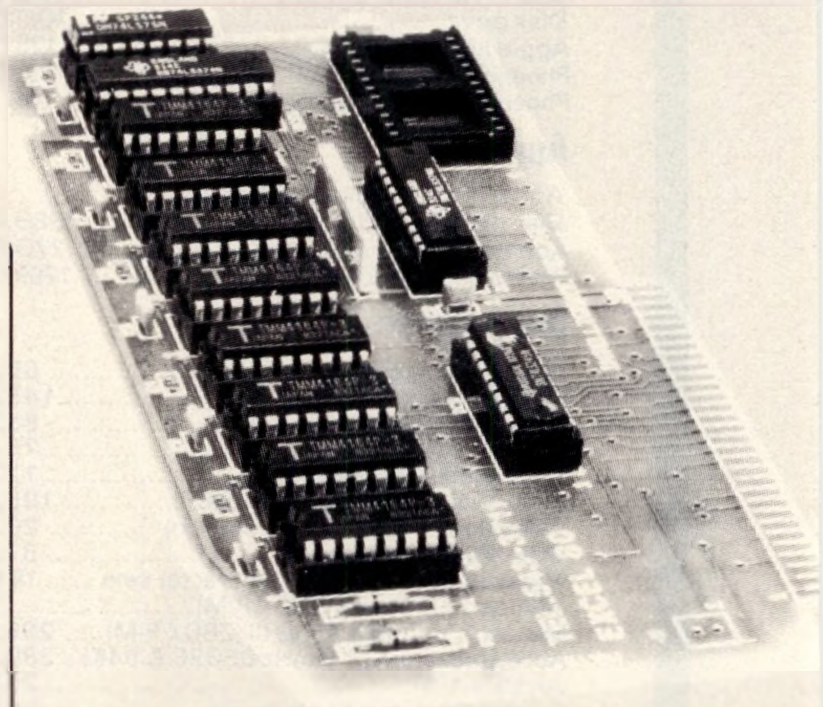

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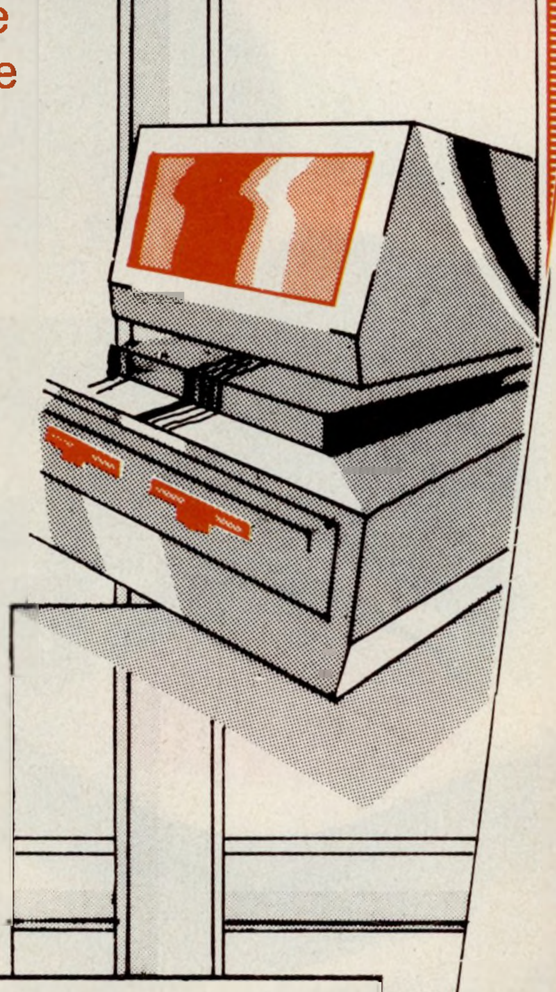

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North Star Horizon-20-64K	Good	15 mth	2	2,395	1,500
NEC APC—HO2+Benchmark WP S/W	As new	5 mth	2	2,360	1,595
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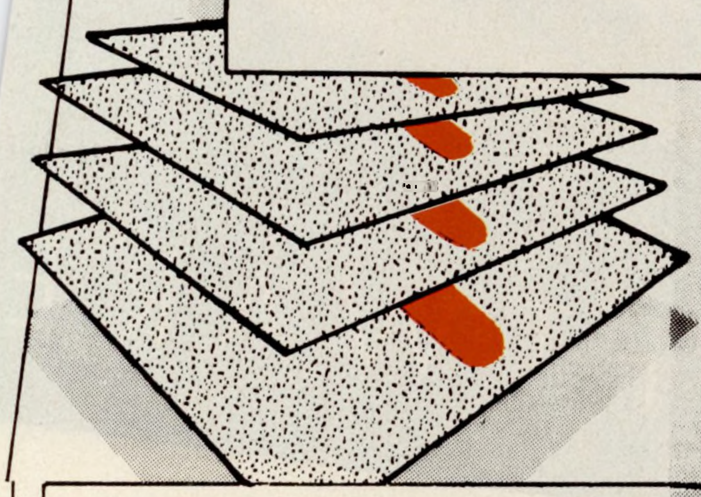

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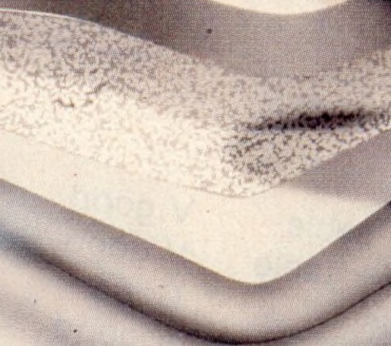

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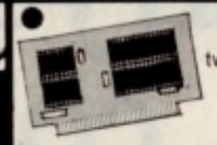

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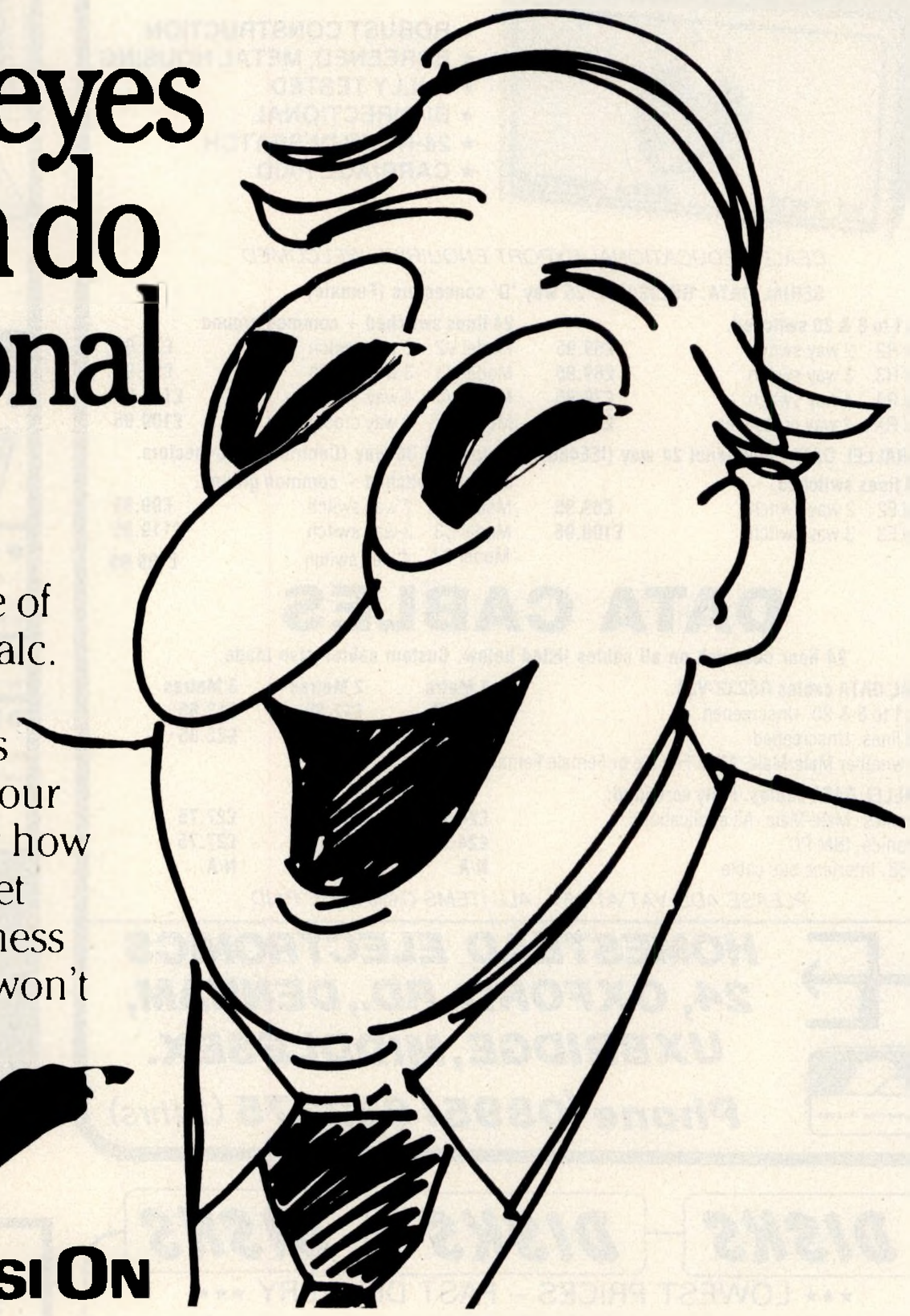

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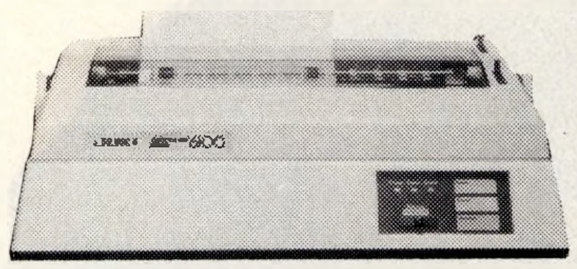

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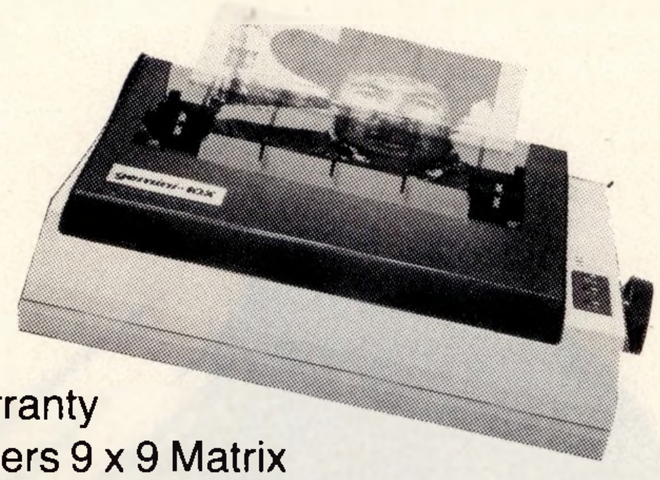

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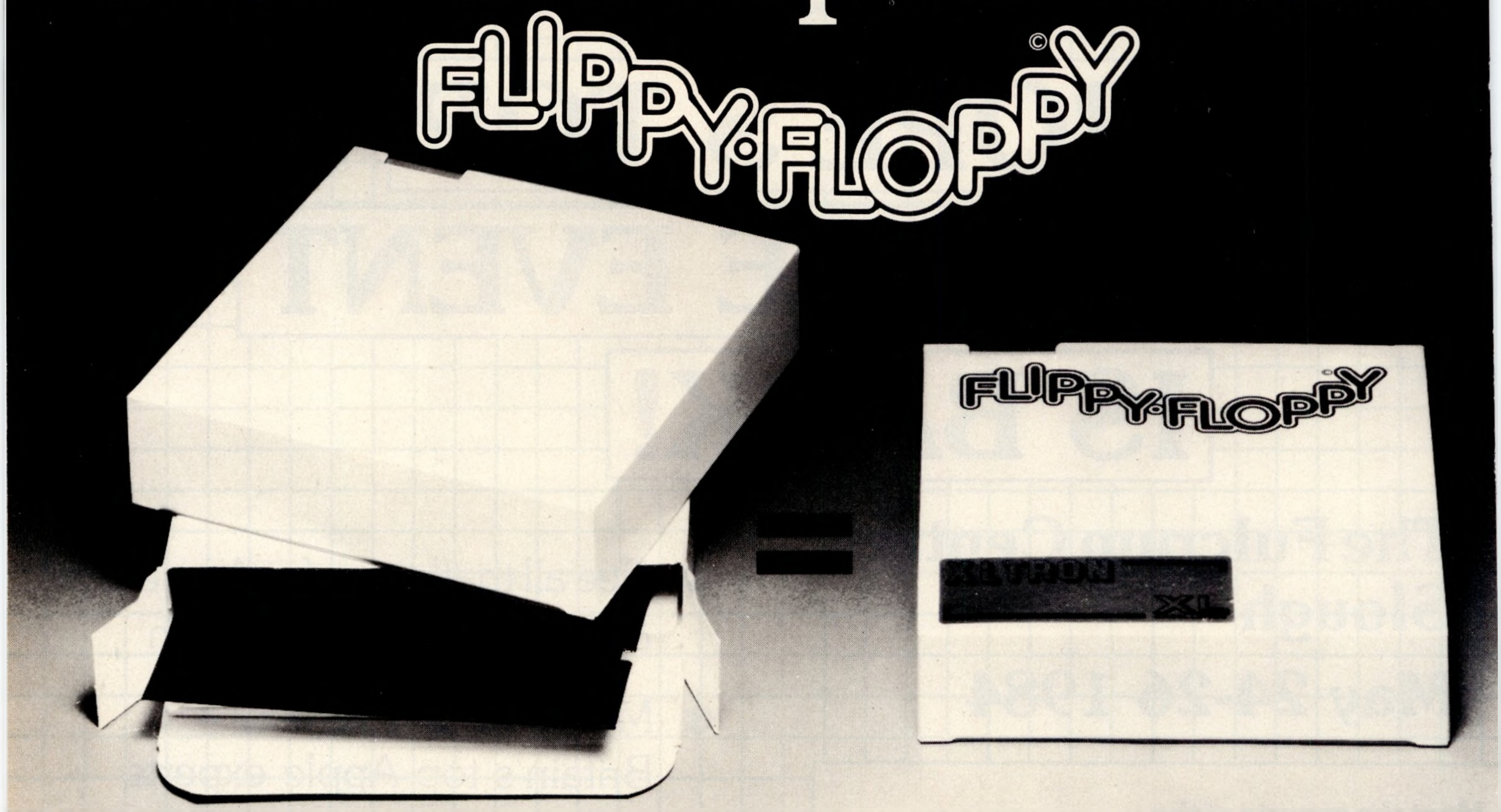

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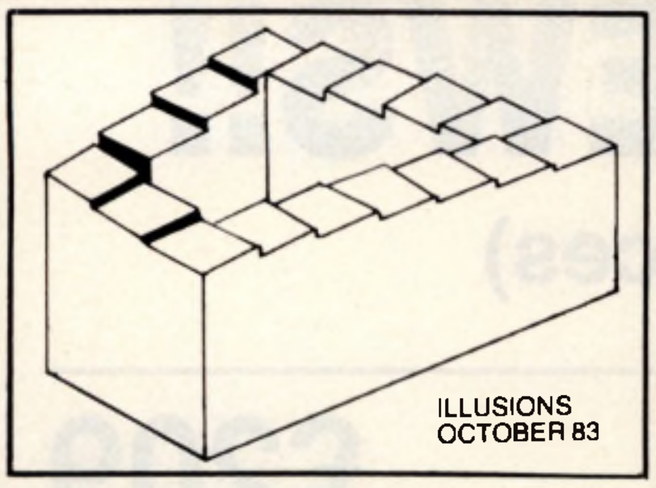

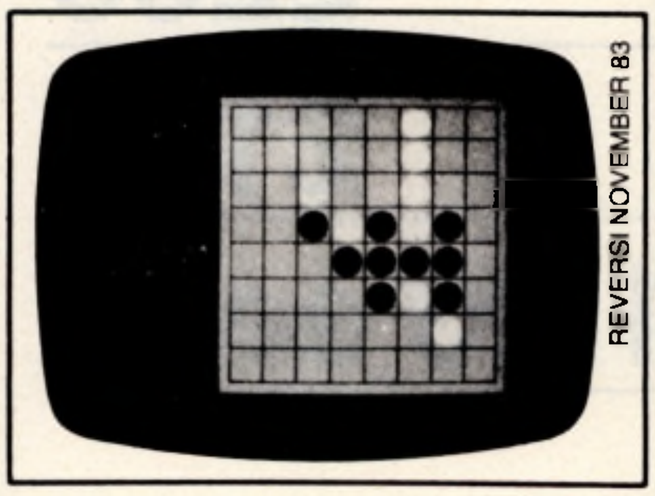

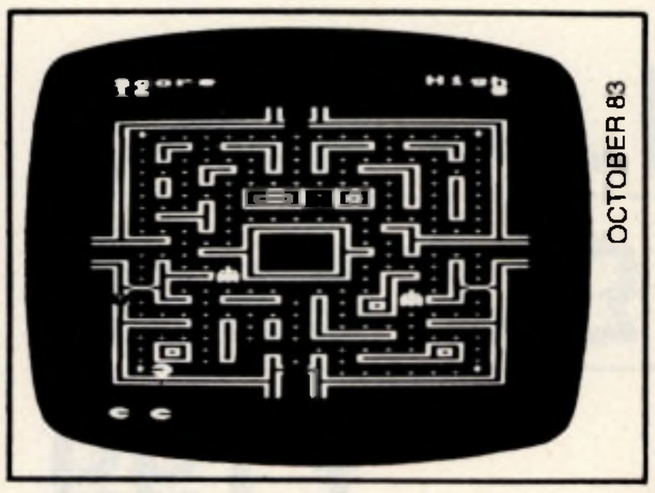

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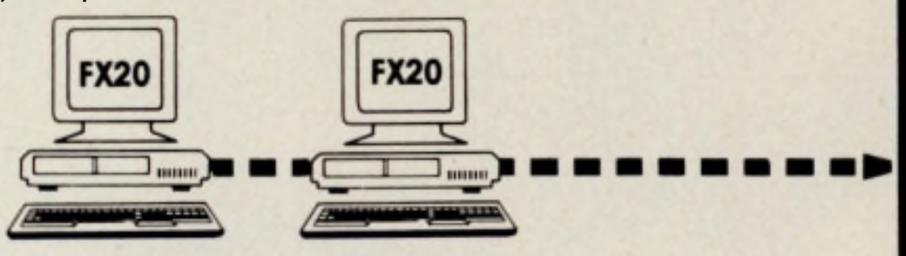

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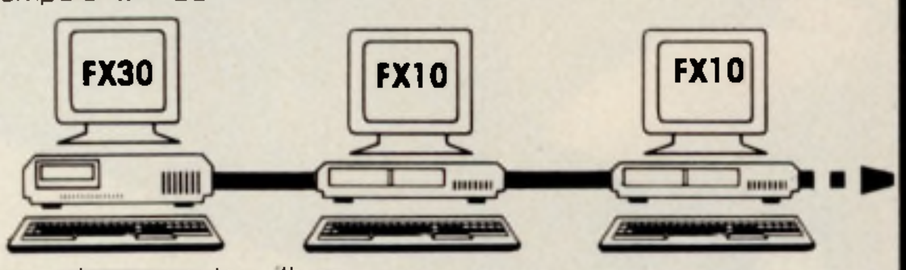

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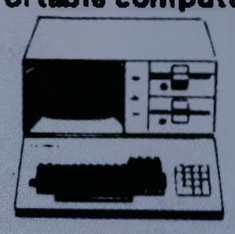

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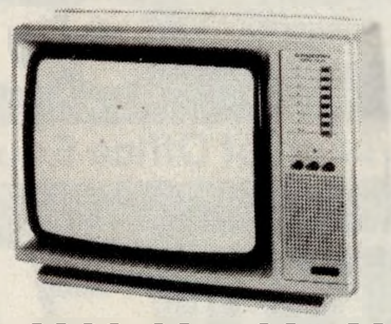

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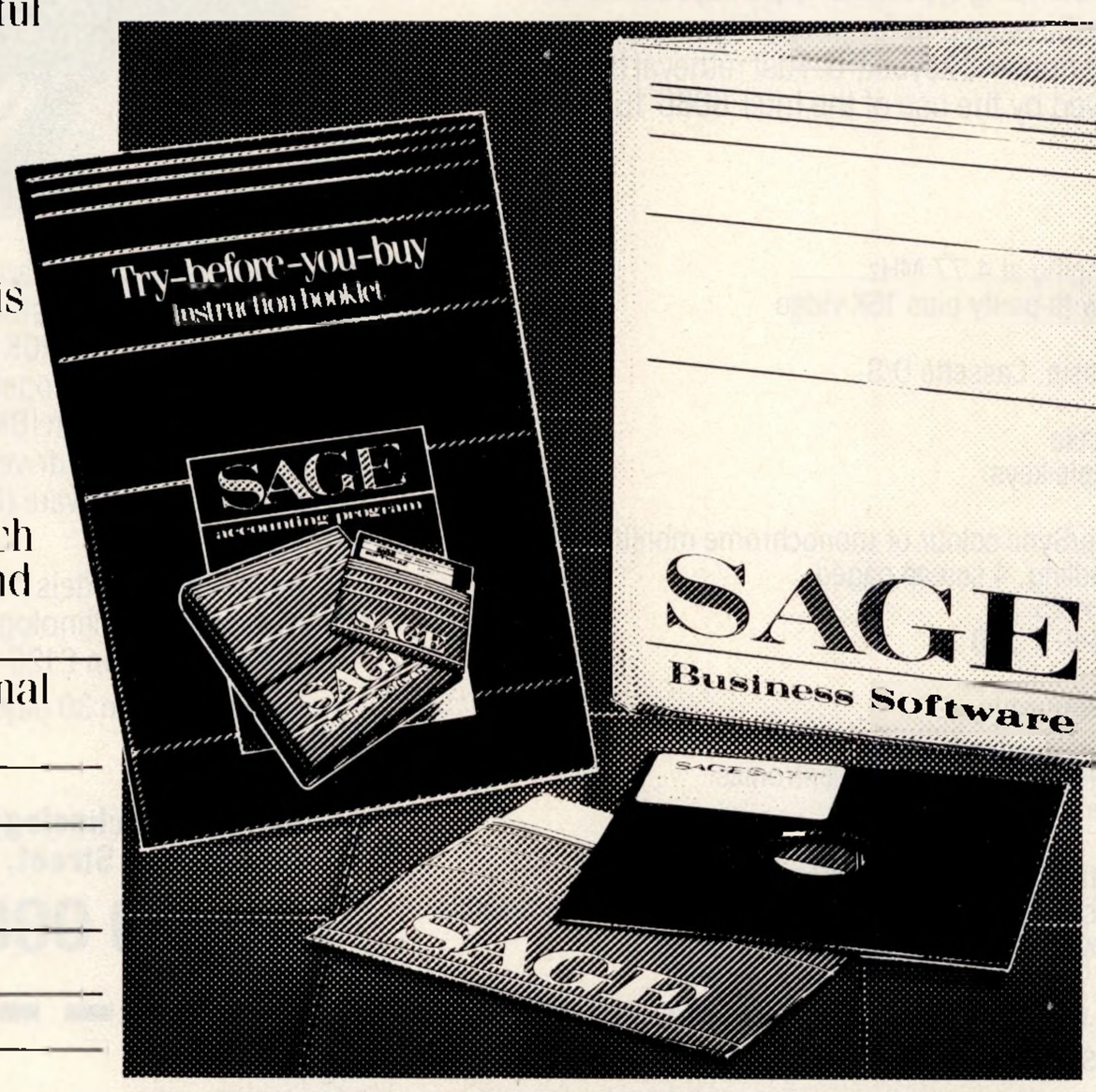

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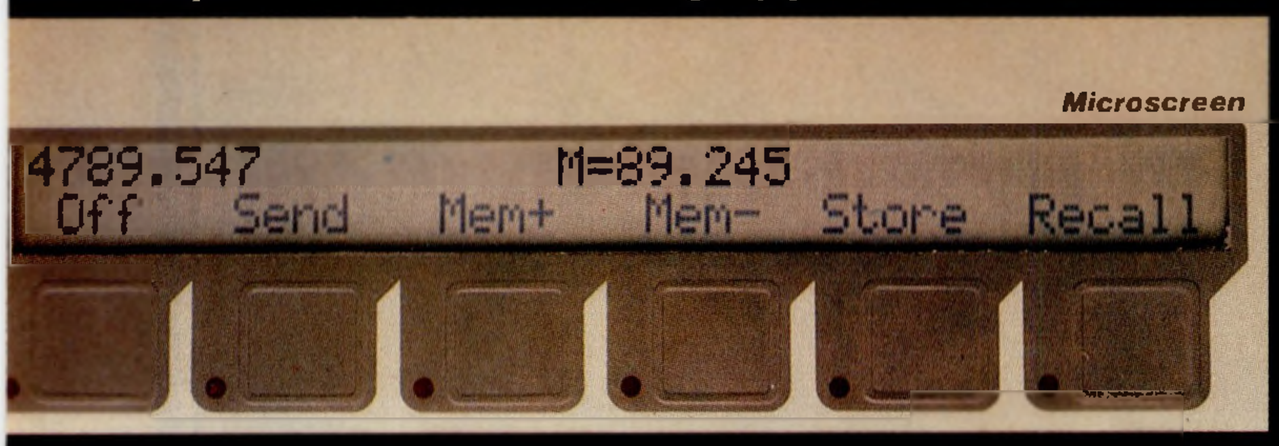

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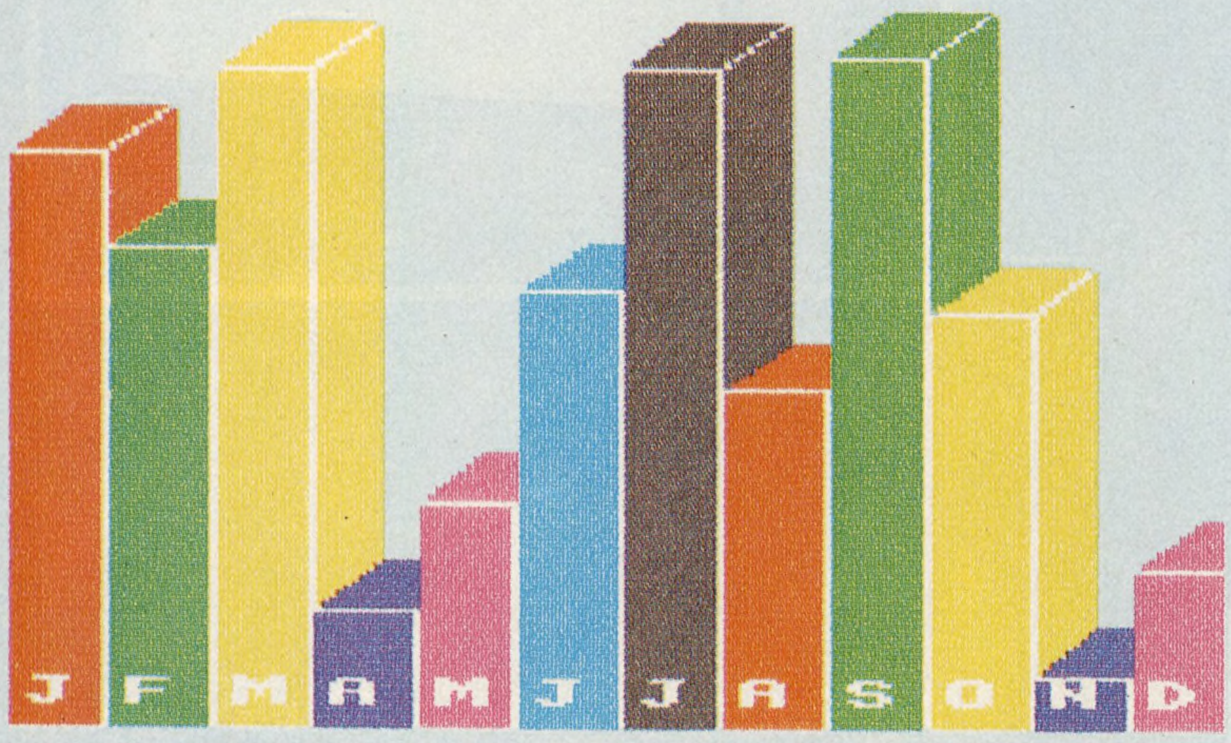

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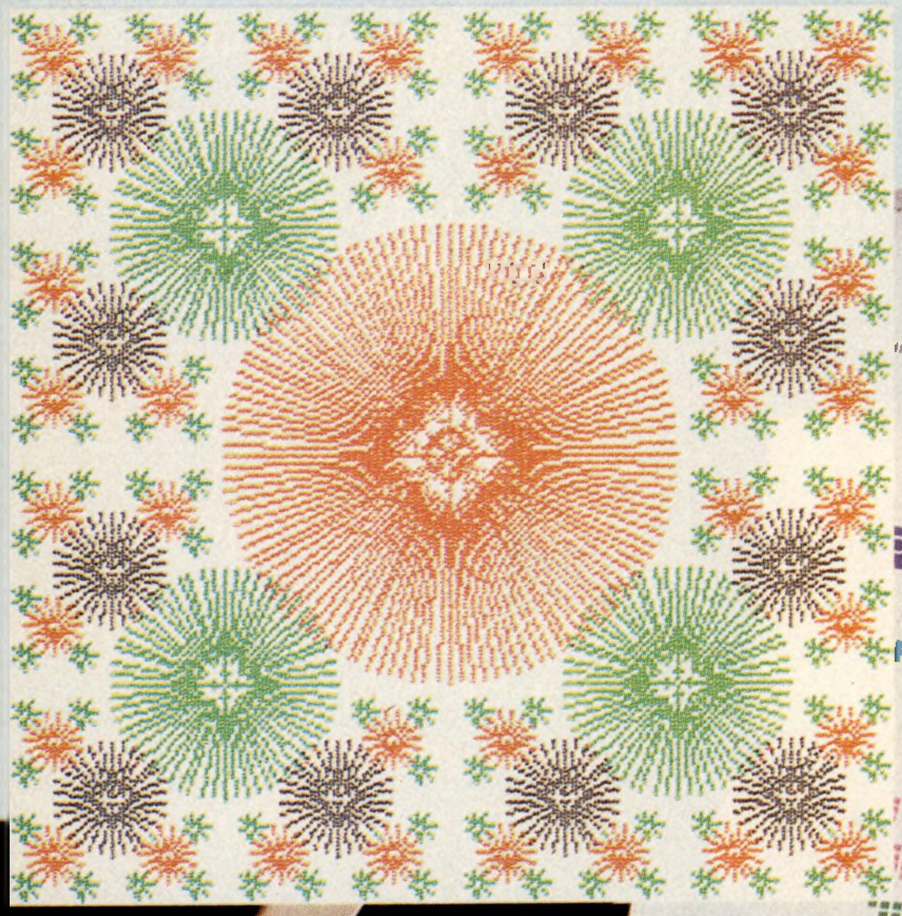



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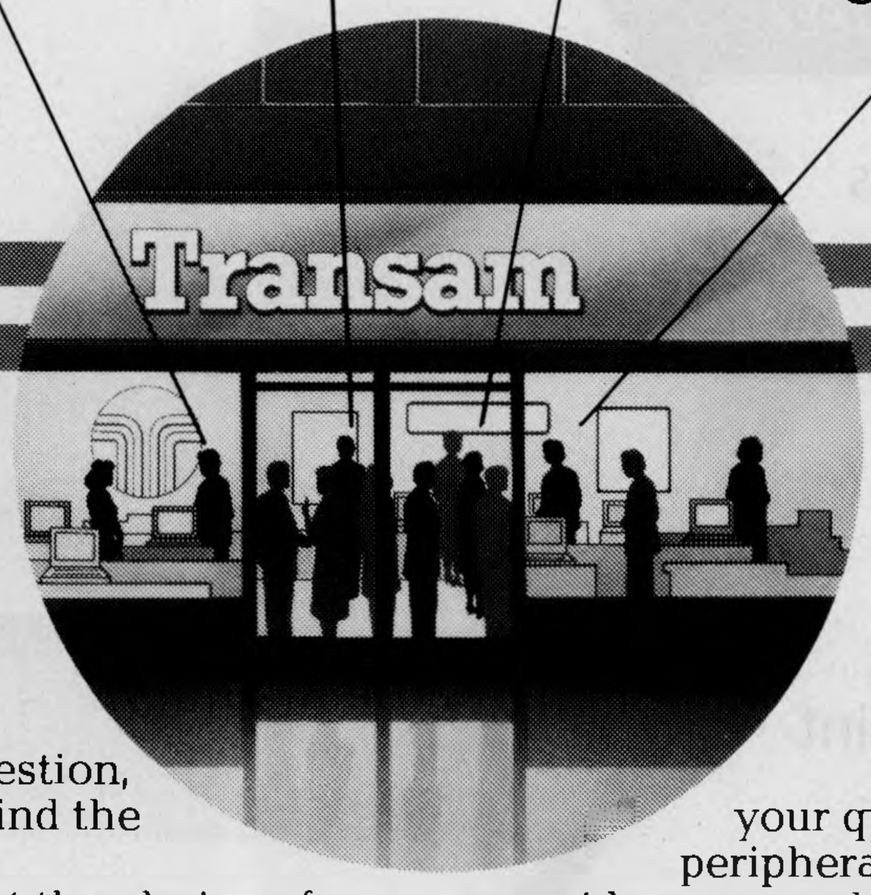

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The NewBrain State of Affairs



Take it from us: buying a NewBrain remains one of the best investments you can make.
As the Dutch importer, we were well aware of NewBrain's special features. Now we produce this tiny computer ourselves, and our research staff has analysed its lay-out and system software. And there is only one conclusion: the NewBrain belongs to the select group of ingenious British designs; the machine is a survivor.
Sounds like producer's propaganda? Sorry, but we know what we're talking about. Tradecom International is active in the world of big mainframe computers. We supply terminals, printers and other peripherals and adapt them, if need be, to our clients' requirements.
Designing data communications networks is another of our specialities; we offer multi-colour solutions connecting IBM, DEC, Burroughs and any other protocol in the book. Our clients rank among the big multinationals; the names which keep coming back in the headlines of the stock exchange pages.
In addition to mainframes, we also know what minicomputers are all about. We design and deliver, for instance, a system custom-designed for medical specialists, based on the Hewlett-Packard/250 minicomputer.
Tradecom International is no mass-producer; our products are made to measure.

The NewBrain fits well in our marketing philosophy. We don't regard it as a refined game-machine (although we do offer the best of these as well). It is, instead, a professional tool for professional applications.
Among the applications lies the field of education. So we've designed the Masternet, a module which can link up to 15 NewBrains, together with floppy disk drives, printer, cassette recorder and eventual sub-modules — each bringing into use another 15 NewBrains.
This sophisticated classroom network allows teaching by computer. The possibilities are myriad. Using the Masternet, the teacher can communicate with one pupil, a group or the entire class for lessons in more than computer programming. Geography, mathematics and more can be laid open to the pupil using our system.
And we've written a program for language training as well, which allows the loading and recording of correct spelling *and* pronunciation on the same tape. The image on the screen can be combined with instructions from the recorder; a handy and functional tool for any school.



These examples show the way we see the NewBrain. It gives the best performance in a professional environment; a quality you may benefit from at home.
We don't consider it our job to offer glib solutions. We provide tools to solve problems.
So don't expect yet another model from us every season. We aim for carefully thought-out extensions and improvements. (The term of depreciation on your NewBrain has taken a turn for the better, dear buyer. Take it from us: you've made a sound investment.)
Expansion interface, disk controller and disk drives (200, 400 and 800 Kbyte) are now available. Standard CP/M[1] programs can be run on your NewBrain. And there is much more to come.
As you'll understand, reorganisation and rescheduling is currently the order of the day at NewBrain. But we'll surmount these problems and grow.
With a period of rumour and liquidation behind, it is now 1984: NewBrain's future has only just begun.

NewBrain

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PCW125

NEWSPRINT



In the cause of friendlier operating systems, Guy Kewney reports on Unix-like S1 and Digital Research's Virtual Mouse. Plus a look to the future with voice-driven programs and a spaghetti western.

Brave new operating system

Unix expects you to sit at a remote terminal and be very clever, CP/M expects you to be very patient, and MS-DOS is hardly any different.

None of these understand multiple computers, only one knows the first thing about multi-tasking, and parallel processing and networks are beyond them all.

But it takes a brave man to look disparagingly at CP/M, Unix and MS-DOS and throw them out, sit down and write his own operating system.

It takes a braver man to bring that operating system to market and try to get other people to throw their established systems away — Multi-Solutions boss Charles Lombardo is the brave man in question.

His product is S1, and he announced it at Softcon with the ringing headline:

'Unix is a dinosaur.'

He went on to castigate CP/M and MS-DOS as 'toys' and offered his product as 'the world's first 4th generation operating system.'

What impressed me was that nobody laughed.

S1 is a child of Unix, in the sense that it is Unix source code compatible — programs written for Unix will run on S1, says Lombardo.

But it looks a lot further into the future. It can read and write CP/M, Unix, p-system, Flex, IBM 3741, DEC Files 11, MS-DOS, and other files. It also does complex data handling, which goes under such inexplicable labels as record files, stream files and keyed files, Isam Vsam and B-Tree.

What makes it truly special (for me) is that any task in a system can run on any computer in the network. And each system will display a full, quickly-changing, bit-mapped screen.

Lombardo claims that up to 256 processors can be simultaneously operating.

It isn't just the computer freaks and Unix enthusiasts who take him seriously. The US stock market has already found over a million dollars for him, and the general comment from people is: 'We're watching you very carefully, Lombardo!'

He's contactable in Lawrenceville, New Jersey, on (609) 695 1337.

Programmer's paradise

Journalist and programmer Peter Laurie says he is going to call his next book: *I wonder why it did that?* — a cry which is an encapsulation of the frustrated programmer's despair at ever getting the bugs out of a program.

Anybody who has ever used a computer of the IBM generation or earlier will know at once what I mean.

All this is propaganda in the cause of better operating systems.

It is also, more to the point, wisdom which is now being preached inside Digital Research (DR), which has discovered a Virtual Mouse.

A mouse is something which moves a pointer around the screen. A Virtual Mouse is more complex: it moves around a three dimensional space which contains all your data, and all your programs, and all your memory.

It may sound complex: to build one certainly is. But to use one may be to bring the computer's habits one step closer to those of humans.

The CP/M people are now talking about a Version 4 of Concurrent CP/M. The difference between the current version (Version 3.1) and 4 is that Version 3 claimed to be the last of the old, unfriendly, mousetrap CP/Ms.

Version 4, says DR, will have the new user interface. In that version, you will not have to find and understand a programmers' manual to protect a data file with a password. It will be obvious how to do it.

And having done so, all you will need in order to read your own file will be the password — something certainly not true with all previous versions of Concurrent.

The advantages of this operating system are all in the future, and there are lots of other hurdles for DR to pass before the future arrives. But the executives in charge of the company obviously believe that their window on the future is brighter than Microsoft's Windows.

Paul Bailey, UK boss of the company, looking a little pale after reading this column's comments on Concurrent recently, showed me a demonstration organised by a collection of manufacturers, all of whom were running Concurrent on their machines, and held out the promise of more.

The parade was impressive, and since Bailey was able to show the clincher — IBM programs running as if under PC-DOS on an IBM, but concurrently with CP/M programs — he obviously felt that the victory was won.

After all, you can't run Lotus 1-2-3, Supercalc and WordStar simultaneously on any micro, unless you have Concurrent, even if the machines will run all three separately. And many machines (without Concurrent, of course) can't manage all those titles.

I wasn't the least bit surprised to be able to crash Version 3.1 and Softnet (the networking part) and PC-Mode (emulating the IBM micro) all at the demo.

What still worries me is that programs like PIP, the most useful CP/M program ever written, still don't understand all the clever things that CP/M can do.

You can use PIP to copy part of a file off disk onto paper, spacing it to 50 lines a page, and adding a few other bits and pieces. It takes concentration, lots of trial and error, and the patience of Job.

But you can't do it if PIP finds that the file has a password. It should ask 'password' — but it hasn't been re-written, yet, to do so.

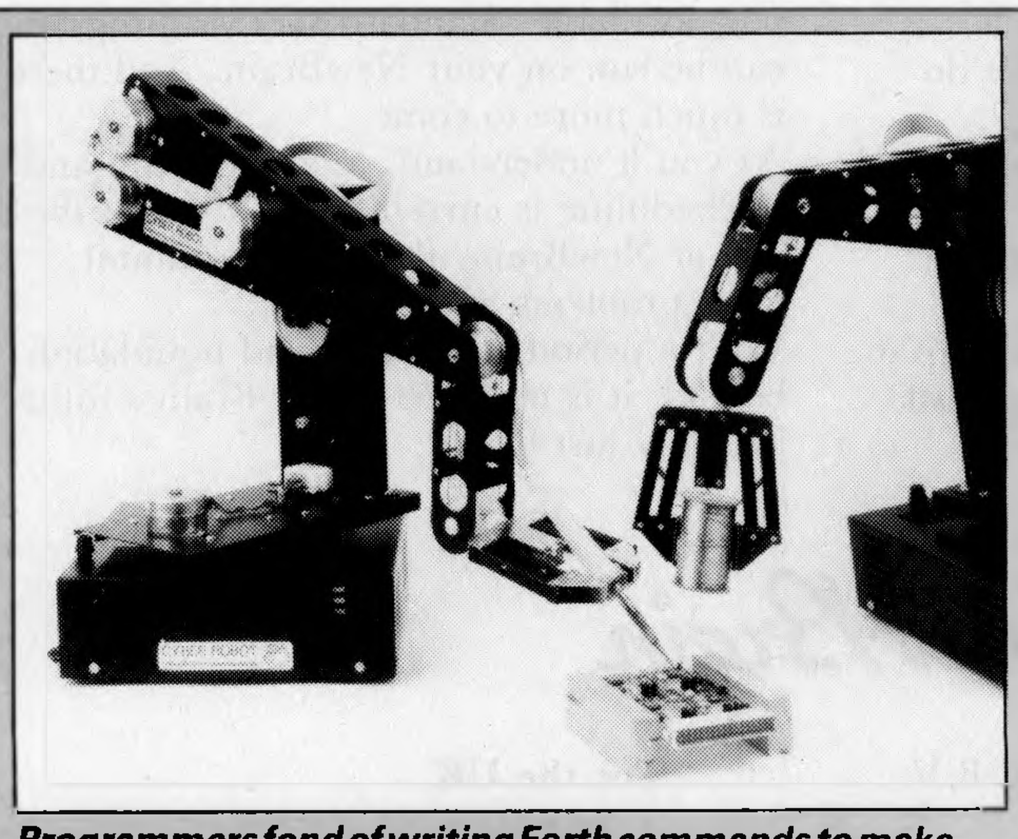
The Virtual Mouse, when it comes, will be five times as wonderful as password protection on text files. Or maybe fifty times as wonderful.

But how long will it be before I can Virtually Mouse my way around dBasell? How soon will MicroPro wake up to the Virtual Mouse and put holes in WordStar for it to run through?

For people like Olivetti, just releasing a real microcomputer and the likelihood of seeing American Telephone and Telegraph adopt it as the AT&T micro, the Virtual Mouse and Softnet must look like winners.

For the rest of us, however, the wait for a friendly operating system (even 3.1 can still crash with an operating system error, leaving you despairing about an hour's wasted typing) is at least a year away.

Unless somebody else gets there first.



Programmers fond of writing Forth commands to make robot arms move will be delighted by Cyber Robotics and the Cyber 310. It's a robot arm driven in Forth. Details on Cambridge (0223) 210675.

Schoolmaster approach

One company trying to get to the point of a friendly operating system ahead of DR is Bromcom, or the Bromley Computer Consultancy.

Well, that's a bit of an exaggeration. The Intermixed Multi-Processor Operating System isn't really an operating system, more of a schoolmaster for other operating systems.

It doesn't try to handle the nuts and bolts of computing—reading keyboards when programs want them read, printing on displays when programs want displays lit up—but it coordinates those that do.

'It has been designed to utilise standard micro operating systems on multi-processor based computer systems.' This grand-sounding phrase means that if you have a SuperStar system—multi-user and also multi-processor—then each user can run an application under any desired operating system, and Impos will do the impossible (!) and reconcile any differences.

Other computers can have Impos: 'It has been written in C language, and is therefore, highly transportable to various types of processors,' says Bromcom. 'It was initially on the Intel 8086 chip in the SuperStar 16, but will soon be on the iAPX 186' (a more powerful version of virtually the same chip) 'and slaves can be either Z80A with up to 128 kbytes of memory, or the 186 with one megabyte.'

Details on (01) 697 8933.

Wake up, Commodore!

Commodore didn't announce its new machines, nor did the company cancel its old machines, at Softcon. At press time, it was expected that the new Commodore machine would, after all, be an IBM lookalike, to be priced somewhere under $2000 in Britain, and portable.

Word reaches me that it could look like the Bytec Hyperion, and that Commodore hopes to have them to sell this year—September is the rumoured month.

So the question is: What has happened to the Zilog Z8000 chip which Commodore has the rights to build and use?

This machine, when it comes, will probably not be a Z8000 machine, but an Intel 8088 or 8086 machine, running MS-DOS. You can't do that on the Z8000. With the Z8000, however, you might well build a multi-user system with Unix, but that's a long way away yet—sources suggest a year away, which in Commodore terms means just guesswork.

The failure to cancel, however, is less certain. News of the machine (the 264) announced at the Las Vegas Consumer Electronics Show is of the unofficial sort, and it all reads 'not for release this year, after all, unless somebody changes their mind.'

Commodore got into this business by leading with technology. The PET beat the Apple II into the world and, at the time, everybody said that it was an impossible product. The Commodore 64 is, in all essential details, just a cheaper PET, with colour and noises.

It really is time that company got off its comfy chair, and did something new.

Going soft in the head

Cunningly putting on a public display of a cake it has already eaten, the Computer Retailers' Association (CRA) has announced indignantly that there is no truth in the suggestion that the law on copyright needs tightening up to cover software.

It's a nice cake, and it's a shame it got eaten in the same paragraph where the CRA states that it is to publicise 'the fact' of copyright protection.

The CRA is also stating that it is taking steps 'to promote a Private Member's Bill to amend the Copyright Act.'

Not that the current act doesn't give protection, no, no: it's just that the CRA wants this protection to be 'self-evident' to everybody.

The CRA's argument is that Anton Piller orders have been obtained against people suspected of having pirated software. Anton Piller orders (grossly simplified) give the plaintiff the right to burst in and seize evidence.

One day, the CRA may look back in triumph, when there has been a proper court decision, and say it was right all along, and that copyright did protect software after all.

But I know of too many software disputes where lawyers on both sides are, even now, debating whether to test this still untested law, and are arguing that computers don't work the way people do, and don't work the way gramophones do, and that there is money to be made out of the lack of clarity in the law.

I warmly urge the CRA to stop whistling in the dark, and to get that act updated, fast. And I also urge software houses to recognise that, as long as software is supplied on audio tape, people will copy it, whatever the law.

(Also see the feature on software copyright in this issue: Breaking the law, page 232—Ed.)



The machine which inspired the Japanese and Microsoft to invent MSX (a blueprint for home computers) is going it alone in the UK.

The machine is the Spectravideo (Benchtested in March) which is available through CK Computers of Weston-Super-Mare. Now Spectravideo Ltd has set itself up here, in London, to distribute its own micro.

What this means to the customer is simple enough: Spectravideo reckons there is so much interest in the micro that its original, small-scale plans to sell to a few shops through CK need to be beefed up.

So CK will carry on selling to small shops, but the company itself will supply the chains. Details on (01) 330 0101.



Quarterdeck Office Systems' DesQ package allows a user to put his own software into the computer windows.

The picture shows a DEC Rainbow, with WordStar, Lotus 1-2-3, and dBase II all running together.

Actually, it isn't a simple process, making several software items all live happily together in the same machine, and all run at the same time, too (Quarterdeck suggests that users don't try this themselves).

Let the dealer do it, the company says. Therese Myers, Quarterdeck president, said: 'It was because of our experience in office automation, that we learned that users did not want everything packaged for them. They wanted to feel as if they could customise a system, especially the software, to fit the way they worked—rather than be forced to follow rigid guidelines.'

Cost of DesQ, initially, is $399, for MS-DOS and IBM PC computers. I know of no plans to put it on the Sirius or Apricot, however.

Quarterdeck is in California on 1918 Main St, Suite 240, Santa Monica, CA 90405.

NEWSPRINT



Giant distributors Softsel obviously don't share my own initial disbelief of 'Jane' — a product from a new company, and described as 'the simplest way to operate a computer.'

Jane is a mouse and windows, for the Commodore 64 upwards. It costs nearly $300, and does word processing, spreadsheet, and list management; and can generate up to four onscreen windows for display of information.

It also runs on Apple, Atari and IBM micros, and the founders of Arktronics Corp, who released it last August in a small way, have signed a deal with Softsel, giving Softsel shops the right to sell the product.

It runs 'under its own operating system', say Howard Marks and Bobby Kotick, who promise delivery of IBM versions by May.

Spaghetti Western

Oh, boy: are we ever going to spend the early 2000s (next century, twit) cursing the politicians who have decided to 'cable Britain' with wire!

Japan is spending between $83 billion and $125 billion to install The Information Network System, using fibre optics and satellite links, to make sure that all communications can be handled by the network. Not just TV pictures, not just phone calls, and not just computer data, but all together, integrated.

Japanese industry will have something like the advantage British industry had a hundred years ago, when Britain had the world's only serious merchant navy, and trade depended on a strong navy. It will have the only serious information network in the world, where business depends on information.

More details of Japan's plans are available in a report from International Planning Information (IPI) for $795. A bargain at the price: details from IPI at Nordre Ringvej 201, 2600 Glostrup — Copenhagen, Denmark on 45 2 63 20 44.

Window dressing

Pascal is building a big claim to being the only truly professional operating system around. Its main supplier, Softech Microsystems, announced a new development at Softcon — windows — which gives the p-System a unique position in operating environments.

It has only to get concurrent multi-tasking on a single workstation, to have the lot — graphics, networking, portable software (programs run on any machine) and windows, even on 8-bit machines.

The latest product was announced on the PC Junior, with the explanation that 'this puts us far ahead of the competition in the 64k environment' — from Larry Allman, director of marketing.

The really interesting product is not the Junior, however, nor the other long list of IBM PC, DEC Rainbow, TI Professional, or even the Corvus Concept and Sage II and IV.

Nice though that list is, the machine which pleases me by appearing on the list is the Apple IIe. That means that the system really will run on 8-bit machines, and Softech can be believed when it promises other 8-bit machines will get Insight Window Designer.

Special offer price is $99, if you order before 1 June; after that, the price will rise to $150. Softech is on (619) 451 1230.

It's so easy

UltraBasic is for the Commodore 64, and expands it with 50 extra commands which eliminate the user's need to remember and understand PEEK and POKE numbers.

Mainly, these features are in graphics and sound, with the addition of sprite graphics control, Turtle commands (as in the Logo language) and time-based operations.

It also handles graphics dumps to printers — Epson, Oki or Commodore printers — and costs around $40 (for cassette — $43 on disk) from Abacus Software, PO Box 7211, Grand Rapids, Mi 49510, tel: (616) 241 5510.

Small move, big impact

Much to the rage of software exhibitors, hardware people took space at Softcon, too. IBM showed its portable micro, and Canaan showed its personal IBM mainframe.

Canaan is a firm I'd never heard of, but it's been around a while: its contribution was to 'take the IBM 370 mainframe, and discard all the features that were irrelevant to the single-user situation.'

The company sells a cheap mini (a bit too pricey to be a micro) which will run programs written for IBM 370 mainframes.

It also links up to other Canaan minis, so that if a user wants to run extra programs, he can run them on whichever one is free. You end up with something that functions distinctly like a 370 mainframe, but in single-user chunks, linked by Ethernet.

And you get windows and graphics, too.

Officially, of course, Canaan wasn't selling hardware, but a 'decision support package' — a sort of spreadsheet — called Impact, at $6500.

The really interesting thing, however, is that in less than five years, every new personal micro will be about as powerful as each Canaan unit today.

Canaan is in Trumbull, Connecticut, on (203) 372 8100.

Texan start-up

If Apple is really planning to plug a 68000 chip into the IIe, it has been beaten to the punch.

The Saybrook, first announced a year ago at the West Coast Computer Faire in San Francisco, is finally at large.

The Texas-based start-up, Analytical Engines, has now announced that a model II is available, with additional languages and programming aids.

There are two versions of this model II: one including 128 kbytes, Pascal run-time p-system, Applesoft-compatible Basic, Turtle graphics, clock and timers. That costs from $900 to $1400. The other version costs $1000 upwards (the price depends on clock speed) and includes a compiler, screen editor, graphics, and cross assembler.

Details from Todd Miller, marketing up, on (512) 346 8430, or write to 3415 Greystone Suite 305, Austin, Texas 78731.

Nature or nurture?

Girls, it is widely regretted, seem less interested in computers than boys.

Theories about why, put forward by programmers Elizabeth Stott and Lucy Werth Ewell, fall predictably into the class of 'It's the fault of marketing' complaints — computers are 'angled towards boys,' they suggest.

So they've come up with some girls' games — and, surprise, surprise, boys like them, too.

The programs are aimed at young girls, pre-teen, rather than post. They are adventure type games, featuring a young lady as the star.

Jenny of the Prairie 'is the story of a spunky pioneer girl who becomes separated from her wagon train and must face the advancing winter alone. Jenny's job is to gather nature's provisions from a hazardous environment.'

There is also Chelsea of the South Sea Islands—she got there from New Zealand and has a pet Kiwi—and Cave Girl Clair.

Futurism gets a look-in with 'Lauren of the 25th Century': she takes over responsibility 'for maintaining a reclamation project at a sun-baked desert outpost—the sun provides solar energy, but also threatens the fragile life forms she has pledged to protect.'

You need an Apple II and $40. Details from Rhiannon, or from Addison-Wesley Publishing, which is distributing the games.

Free speech!

Cumana has not taken kindly to having its diskette prices quoted by its rivals—especially, it says, since the rivals have got the price wrong.

PCW has received a strong letter from Cumana's solicitors, pointing out that advertising from Vilgen Acrylic doesn't meet Cumana's standards for fair comparison, and that 'we would invite you to check with us before printing any advertisement on behalf of a competitor purporting to describe our Client's products and prices.'

On the face of it, one can only sympathise with Cumana.

The drives shown under the enormous headline 'BY FAIR COMPARISON' are not dual disk drives. The prices are not the prices quoted by Cumana, and the drive number quoted is, says Cumana, not a current product. In fact, the fair comparison is not just unfair, it's a load of codswallop.

Readers are invited to check the prices actually quoted directly. It's worth a check: Cumana has cut prices, and the new prices look very close to Vilgen's. An 80-track, double-sided drive, for instance, including power supply, costs £259 plus VAT.

However, one little comment is in order.

In certain parts of the world, if a paper prints things you don't like, you get a friend in government to close down the paper. In this part of the world, you go to court, and prove (if you can) that the printed matter is untrue, or damaging, and you take advantage of the laws that prevent it.

To my mind, people have the right to run their advertisements, true or not. The idea of 'clearing' one advertisement by asking a rival company to say 'OK' is only a good idea if the rival is totally honest and unbiased.

Cumana is not insisting that we do, of course. Other people in the industry, however, have recently taken it upon themselves to pressurise publishers (by commercial blackmail, not legal means) into dropping news stories, printed opinions, and so on.

Fair enough: if that's the sort of press you want, you will suffer the consequences. Just remind yourself occasionally that some people believe that a free press (politically) means a free nation, and the same principles, I think, apply commercially and remember also: a free press should be free to make mistakes and pay the penalty.

And when Acorn puts commercial pressure on Prestel to make Viewfax delete a news item about its 16032 processor, on the grounds that 'it isn't true', then it is time to call the rat-smeller in.

I didn't get any commercial pressure on me, two years ago, to withdraw my report that Acorn's second processor would offer nearly 60 kbytes of extra memory and be available two years ago.

But, it turns out, that wasn't true, was it, Acorn? For that matter, when I reported Acorn boss Chris Curry a year ago as saying that the 16032 board would be ready in June, I was referring to June 1983, and I have yet to see a 16032 board. So that wasn't true, either.

In the circumstances, one might be forgiven for thinking Viewfax's report (that the 16032 may have been dropped) a lot more convincing than Acorn's claims to be working on it.

The report may have been a mistake. Censorship, however, is not the cure.

Optical storage

Optical memory is something which people admit would be nice, but think of as expensive.

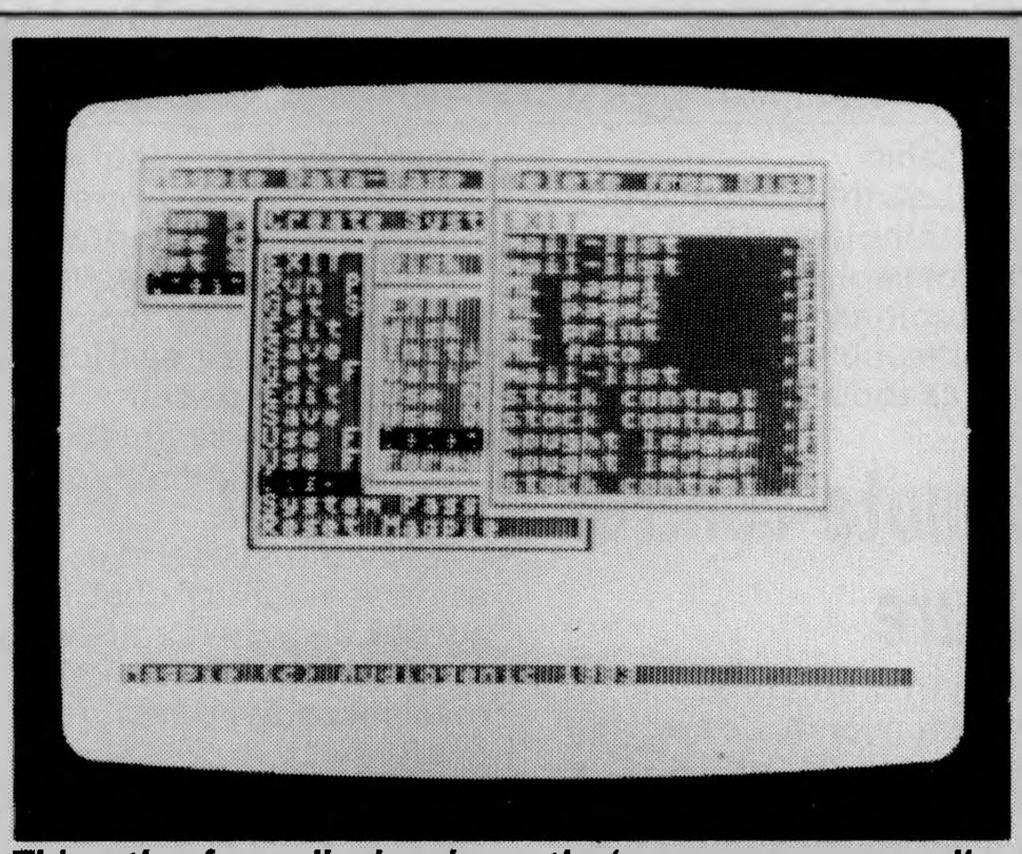
Plans by Information Storage could change that: the company (based in Colorado Springs) expects to produce a diskette with 100-300 megabytes of capacity 'at prices comparable to currently available removable media magnetic disk drives.'

Plans by Philips and Shugart, so far as we know, are aimed at releasing a thousand megabyte drive, for people who can afford to spend around £5000, some time this year.

This company, launched by an ex-Philips man, Steve S Popovich, is looking further away—more than a year away, in fact. But Popovich's new outfit is looking at the IBM XT type of computer, and hoping to replace the hard disk drives with an optical drive.

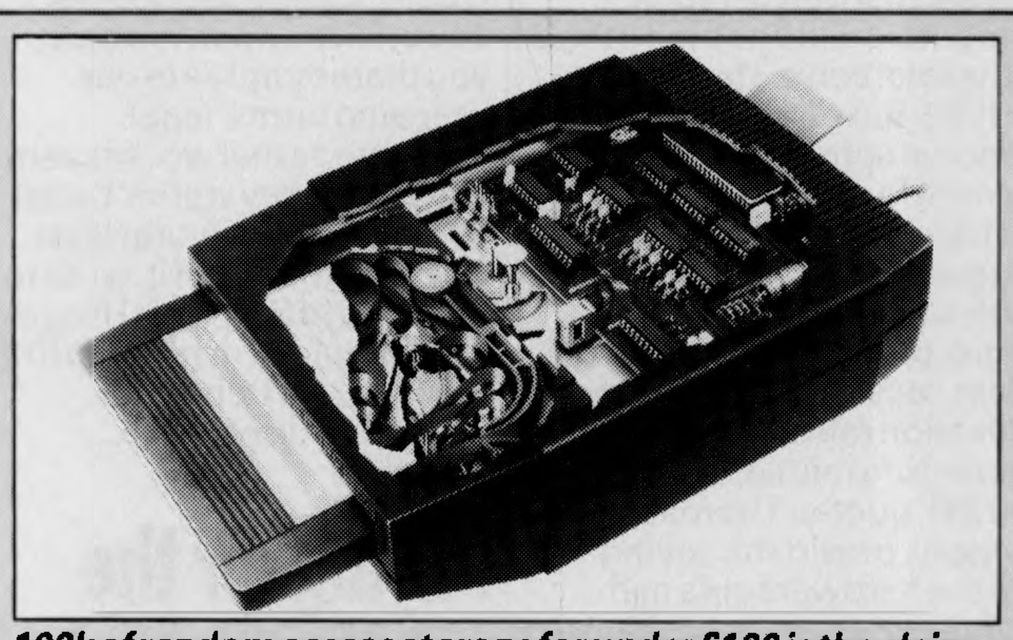
The advantage would be much more capacity, and a lower price for data storage. The disadvantage would be that you'd need to get new software, because optical disks are not erasable. Once they are full, they stay full.

Later models, says ISI, will



This rather fuzzy display shows the 'menu-programmed' database, Magpie, for the Commodore 64. Audiogenic, the distributor, says that most of the setting up of a database on Magpie is done with two cursor keys, and one other, to select options from the menu. Without realising it, you design your database this way. You need a disk, the program comes on a cartridge, and costs £100.

Details on (0734) 586334.



100k of random access storage for under £100 is the claim made by Phi Mag Systems Limited for its new Phloopy tape system, but with only two months left until its target debut, there are still problems.

According to Phi Mag the Phloopy will fill an important gap in the market between slow cassettes and expensive disks. The main feature of the Phloopy is its nine-track recording head that can record and load a byte at a time while performing simultaneous error checking.

The Phloopy drive uses special tape cartridges containing twelve feet of magnetic tape and only one moving part. This is the motor that drives the tape past the head at 15ins a second. This, claims Phi Mag, will produce typical access times of three to four seconds and a data transfer rate of 10k a second.

The cartridges will cost £3.50 each and the drive £143.75 including an interface, two cartridges, VAT, p&p.

Initial Phloopies will only be available for the BBC Micro although other machines are planned.

However, at the London launch which was two months to D-Day (delivery day) there were still some bugs to be solved. The major one being incompatibilities between the hardware and ROM software. This produces at random intervals various errors including the inability to store a 20k program on a cartridge with 66k free! Is this a new meaning of the phrase 'Random access' or should it be 'random inaccess'?

Phi Mag still hopes all will be well on the day. Details on (0326) 76060.

Tony Hetherington

be erasable.

The new thing about ISI drives is the idea of five-plus inch optical disks — about the size of compact music cassettes, but — holding the same as about 300 floppies.

Remote-control future

Another comms product which appears to be evolving towards the idea of remote-control is a 'masterslave' package from CDI (Computer Development Inc) of Oregon.

CDI showed its interesting software on its own equally interesting hardware: unfortunately, most of us have not the slightest plan of throwing away our existing computers just to buy something that adds very little.

However, the idea of having two micros working as if from the same keyboard, one at each end of a phone line, means that two executives can discuss a document or spreadsheet, then switch to data and carry out the alterations, then switch back to voice, until they have agreed on their ideas.

Gentlemanly agreement?

It sounds like the legal fight that the computer press has been waiting for — but in fact the case of IBM's charge that Corona had copied IBM's micro BIOS (basic input and output system) software, is all very gentlemanly, and over.

Corona makes cheaper versions of the IBM, including a portable. Inside it, said IBM, was a ROM chip, with permanently inscribed code that was a straight copy of IBM's own code.

IBM won its case in Los Angeles in January, but then agreed, very chivalrously, not to enforce the law for any machines shipped before 18 February.

This was to ensure 'an orderly transition' in view of Corona's move to a new factory, said IBM.

So, with IBM's blessing, Corona's organisation managed to get a new version of the software ready, worked out when it would be available, and (say industry sources) arranged for its customers to order enough machines to see them through to April.

Corona agent in the UK is Midlectron, in Belper, Derby, on (077382) 6811.

Software shake-out

Something unique in my experience is a trade show where the major subject of conversation is a magazine — and Softcon was that show.

The magazine was *Business Week (BW)*, which came out the week before the show with a Special Report on 'software: the new driving force.'

The magazine is sufficiently minority-interest in its readership in the UK for me to feel no shame in drawing your attention to the edition (Feb 27) as an excellent primer on the American software business.

Facts and figures (*BW* can dig these out of a report on the hum of a bumble-bee) showing how software is booming, were fascinating. For instance, the amount of money spent on personal computers will be about a third of the total computer budget, by 1989. But on software, personal software will only account for roughly a fifth.

The interesting thing was the suggestion, just before an analysis of the Japanese future, that money is available, at last, for software start-ups.

Ovation raised $5 million on the venture market last year, and *BW* quoted Thomas Gregory, president, saying that the hardware side had frightened so many capitalists, they had turned to software. What really tickled me, however, was the suggestion that 'the best time is over' already.

Over already? Software hasn't even started, and the money men are ready to get cold feet *already*?

I'm afraid, however, it is so. A few 'stars' will be able to raise money. But innovators, for the next couple of years, are going to live in the shadow of financiers' ignorance, and the general belief that the IBM micro is an advanced machine. The market is getting hopelessly stagnant, both hard and software.

Legal ambiguity

Governor James H 'Jim' Brown picked the right audience for his announcement that Louisiana would become 'the first US state to prevent the unauthorised duplication and distribution of computer software.' He announced it in the Superdome, where the Softcon convention was being held.

His plan is to make Louisiana attractive to software companies: his method is to put forward a new law which would make those notices about 'if you open the pack, you thereby agree to our licensing terms' legal.

Of course that would seem to imply that they weren't legal *before*, in Louisiana at least. Don't tell me about it, write to the Guild of Software Houses and complain, or get help from your nearest Computer Retailers' Association member.

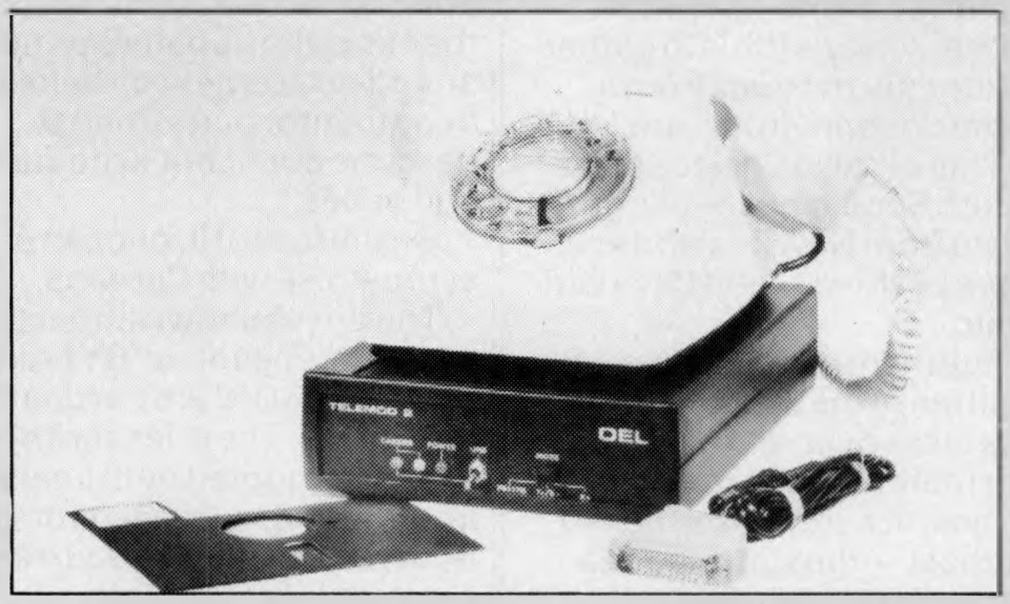
Paying for the privilege

Wonderful though electronic mail is, I suspect Hawkeye Graphix is onto a winner. The company is offering software to let you establish your own electronic link with your office, rather than having to work through some outside corporation.

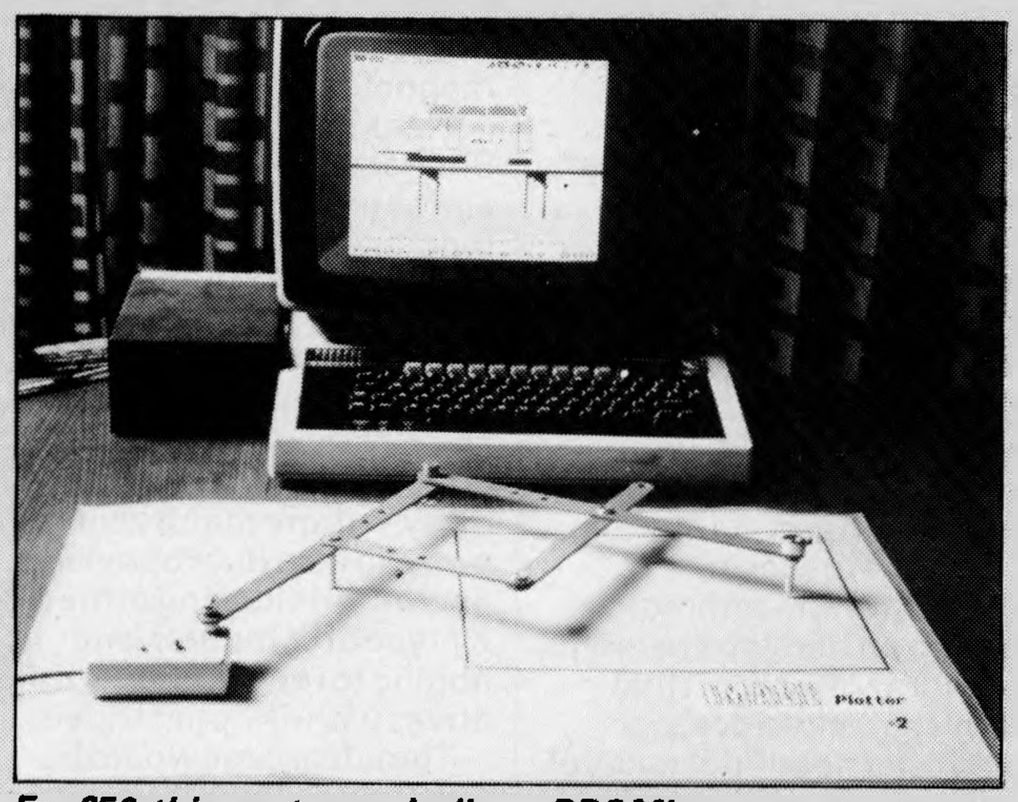
The company has considerable experience with comms software and so I do expect its 'private electronic mail system' to work.

Electronic Mail Manager is described as 'a powerful method of coordinating communications between several offices in a business.'

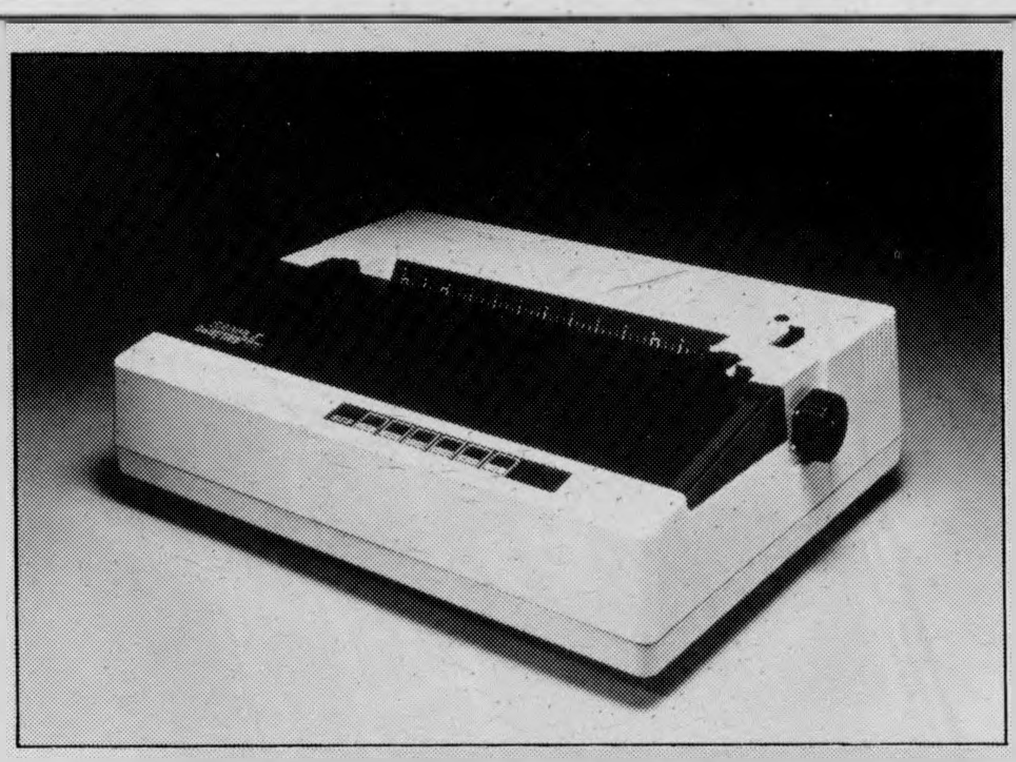
In other words, just because you are out of your office, it doesn't mean you can't reach your micro. With a portable micro, or borrowing the micro of the person whose office you are visiting, you dial into your own computer, and run it.



Any Prism Micronet user who sees this Telemod 2 modem will be struck by the similarity to the Prism Modem 1000. That's because it is. It costs £84, and communications software is available for Apple, Atari, Commodore, BBC, Tandy micros, from £15 to £80, depending on which machine you use. Details on (0768) 66748, or on Prestel Mailbox 09305 1909.



For £50, this pantograph allows BBC Micro users to store diagrams, maps, graphs, and so on, inside their computer memory. The Image Plotter is the first product from a new company, Reekie Technology, which is planning to release a cheap x-y plotter as its second product. Details on (01) 892 2877 or write to Reekie at Beaufort Road, off Richmond Road, East Twickenham, Middlesex TW1 2PH.



As low-cost daisywheels go, this one at £289 plus VAT from Keyaki must be worth a test. It isn't the fastest printer in the world (as you'd expect) but at average 16 characters per second, it's usable for writing letters. Details of the Daisy Step 2000 on (0932) 242777.

The catch is the price. You need the Comms package at $150 per micro, and you then have to buy EMM (written in dBase II) at $150 for the run-time module, then a master-slave pair program at $400, with $100 extra for each additional slave branch . . .

Details on (213) 373 9627 at Torrance, California.

Menus and windows

Eager to take IBM's PC Junior seriously, the US software industry is writing software for it as if you could just go out and buy one. It still isn't that easy, even in America.

Best of a large amount of indifferent stuff was a windowing package from Trillian Computer Corporation. Still unfinished, it follows a package called Visuall, on the IBM Senior, released last autumn.

It's simple enough: it replaces the menu with windows, so that you can see something of what you are doing on the screen while you read the menu. And it works with a mouse.

Trillian is in Los Gatos, California on (408) 358 2761.

Calling all Dragonites

Dragon is officially a GEC company, with GEC McMichael (the consumer electronics division of GEC) taking over sales and marketing.

Anybody having business dealings with the company should now contact the chairman, Ron Bosanko, on Fulmer (02816) 2797.

Sinclair's broken promise

So the Sinclair QL is delayed and orders will take longer than the originally promised 28 days 'because of enormous demand.'

Two questions, please, which you mustn't ask me, because I don't know the answers.

First, don't ask how 'unexpectedly large demand' can prevent a single QL being built. (No, I haven't got one yet.)

And second, don't ask me why people are being so surprised. Yes, I did tell you so, didn't I?

Along the right lines

Matrix printers draw lines across the paper, just like a TV screen. Of course, they *could* draw any picture, any type of lettering, any pattern we liked: but it's beyond the likes of you and me.

Print Command is a 'printer set-up utility' for the Epson, assuming an IBM computer, which contains most of the information in the Epson printer manual, ready to drive the printer.

The thing does all those fancy things you wish you could persuade your word processor to do — bold face, double height, condensed characters — but it also opens up graphics.

Apex Resource, the writer, also promises that a 'create new fonts' package will be available *soon* which will turn your word processor into a print typesetter. Or something.

Details on (914) 221 2611 in Stormville, NY.

Voice-driven programs

If ever there was an application crying out for a computer which could understand human speech, it must be the spreadsheet.

Now there is going to be one (actually there are quite a few coming out of various laboratories) from Texas Instruments (TI) and American Supersoft.

Supersoft is to produce three voice-driven programs: Scratchpad (spreadsheet) DAX (database) and Pages (word processing).

The software will work on TI's Professional and, very sensibly, neither TI nor Supersoft have made any predictions about when the programs will be ready.

Digital Research—going for gold

Plug-in Z80 processors for Apple II and IIe computers aren't new: the difference with Digital Research's Gold Card is that it runs faster, and has more memory (up to 128 kbytes of cache memory) while giving an 80-column display. It runs inside any Apple, in any slot, and provides CP/M Plus, a noticeably improved version of the original CP/M, as well as Basic. Prices start at £400, with £640 being asked for the cache memory version. Ask your dealer.

Prospero's Fortran

Those who were impressed by Prospero's original Pascal compiler will presumably be equally delighted to hear of a 16-bit version of the company's Fortran compiler.

Those who didn't like Pro-Pascal will probably not want to find out about Pro-Fortran, either. But if you want to write Fortran on an Apricot or IBM or such-like, this is one of very few choices available.

Details on (01) 785 6848.

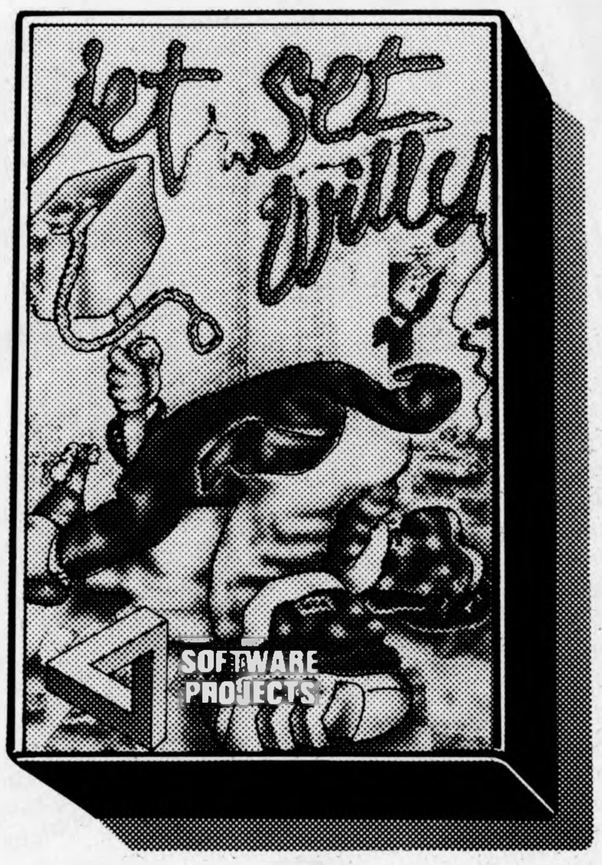
General industry improvement

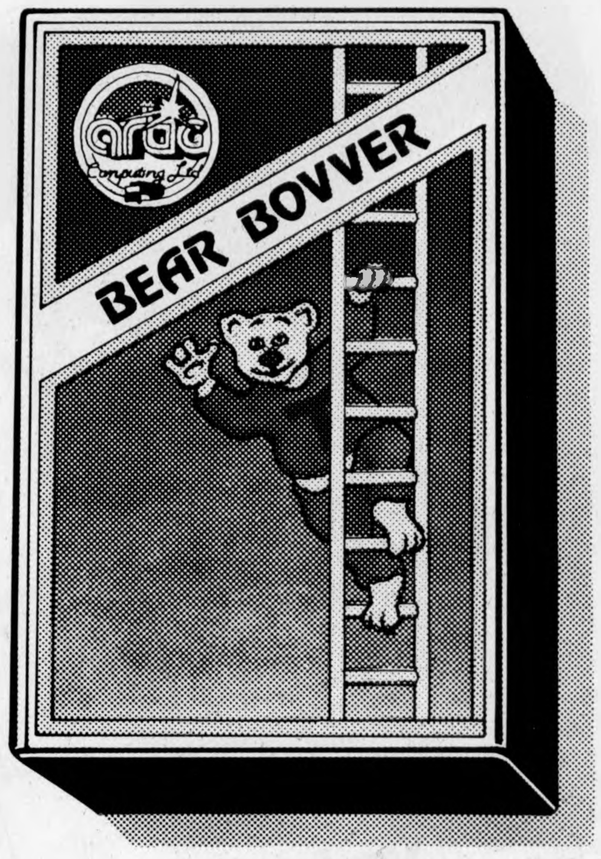
A 'degree of stability' is returning to the video game industry, according to one of its more famous casualties, Atari.

Warner Communications has announced an 'improved performance' for its micro and games subsidiary, which helped the group to a $418 million loss in 1983 (compared with a profit of $258 million the previous year).



When your QL finally arrives, Microvitec has a colour monitor suitable for it, the Cub 1451/MQ3. The main point of compatibility is the matt black finish, to match the QL box, but it is the latest Microvitec model, and therefore of high quality. Details on (0274) 390011.



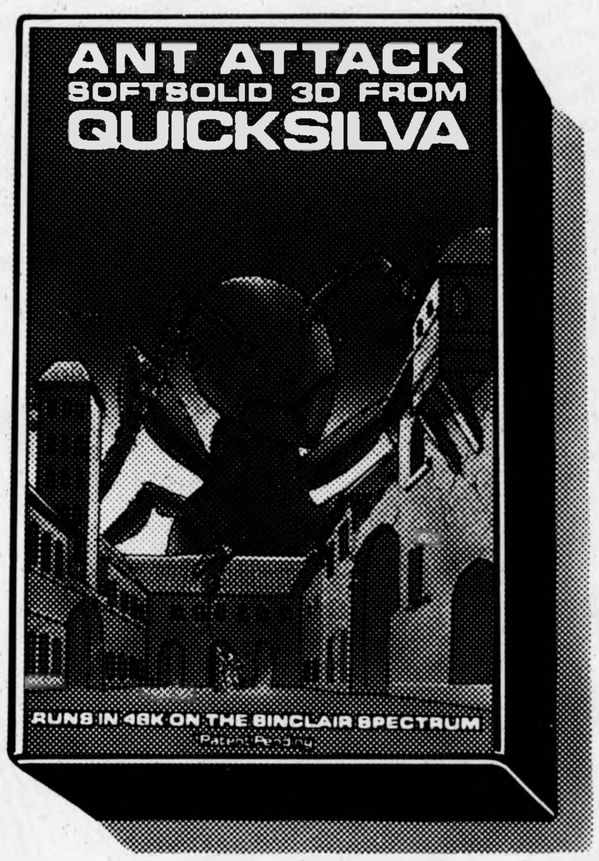


Jet Set Willy £5.95

Bear Bovver £6.95

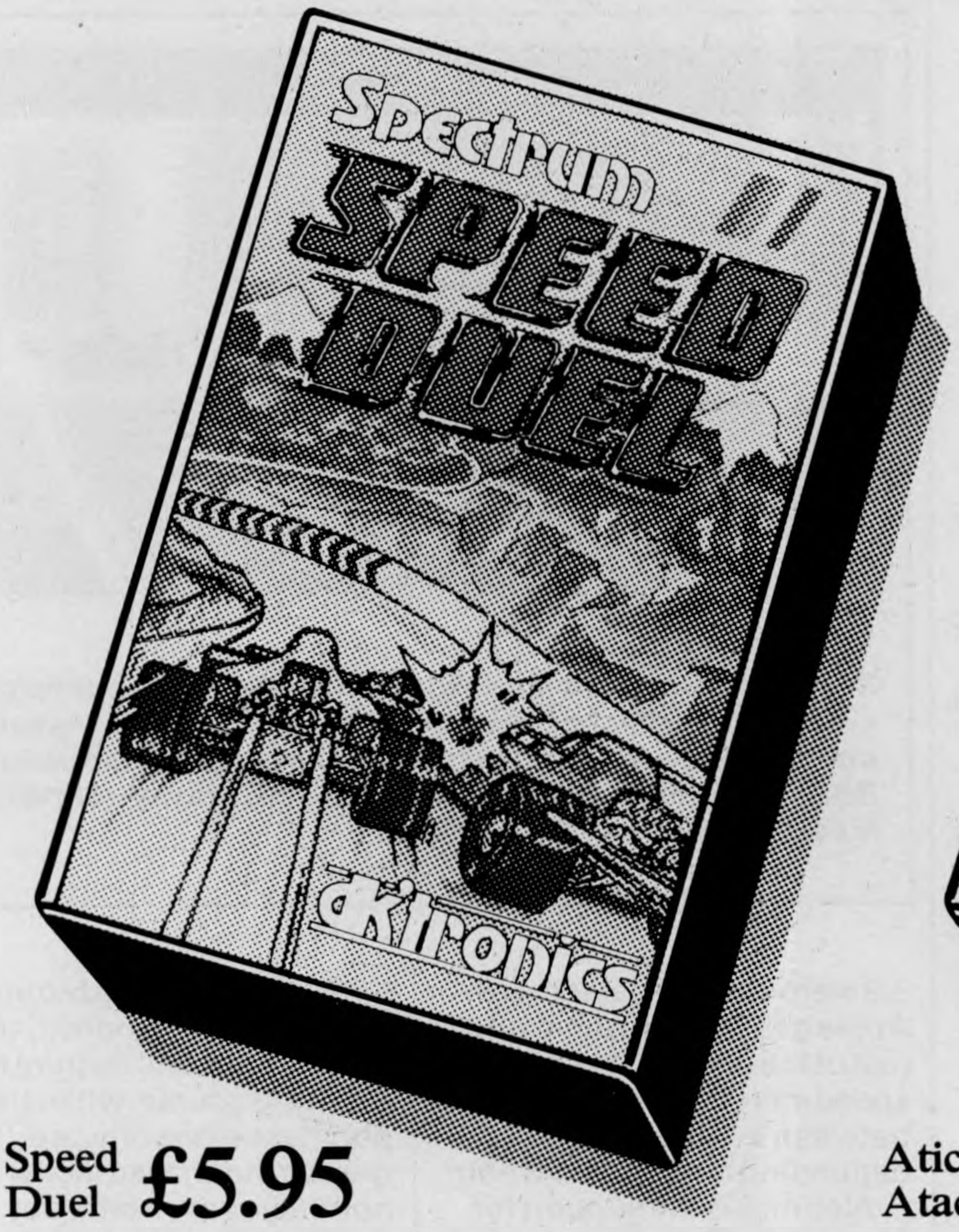
Thousands of Spectrum



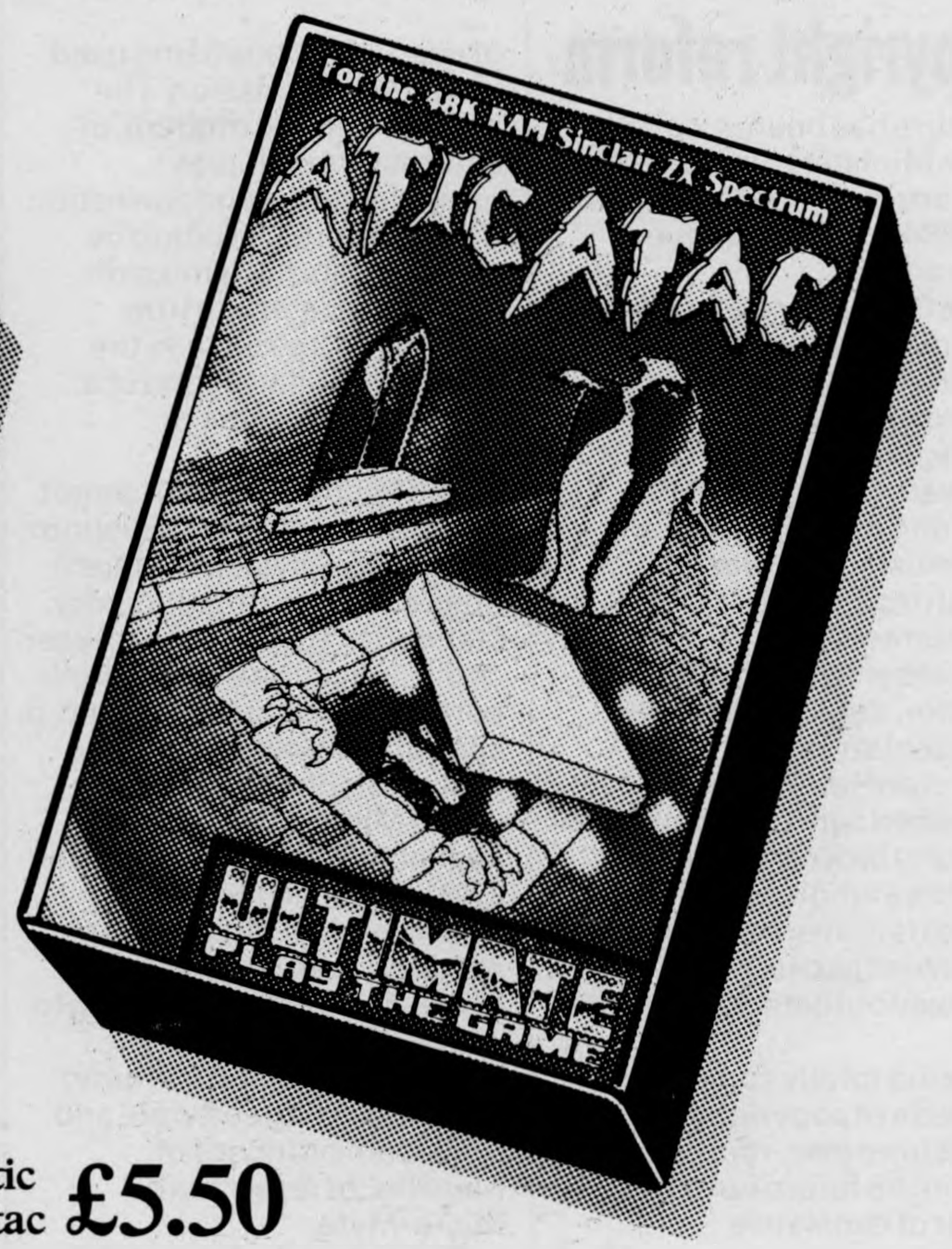


Chequered Flag £6.95

Ant Attack £6.95



Speed Duel £5.95



Atic Atac £5.50

owners know we're in the right game

Last year W.H. Smith sold thousands of Sinclair Spectrums, making us one of the leading stockists in the country and the ideal choice for Spectrum Software.

With Arcade Games ranging from Jet Set Willy to Ant Attack we've got action and excitement just waiting for you.

Of course, our range doesn't just stop at games. As leading stockists, we can also offer you an extensive choice of educational software.

What's more, we're constantly updating the range, as new software is released so you can count on us having all the latest, most current programs.

In fact, for the full spectrum, you can't do better than come to the people who know the game.

WHSMITH

Access VISA Subject to availability. Prices correct at time of going to press. At selected branches only.

PCW 133

NEWSPRINT

Copyright reform

Pressure has been put on the Prime Minister to include a bill to reform the copyright law in the 1984/1985 legislative programme.

The Copyright Reform Group was set up in late February by organisations with copyright interests in the UK, including the Guild of Software Houses (GOSH). Book and music publishers, film, music and video industries are also represented.

In a letter to the Prime Minister, dated 9 March, 16 representatives of the Copyright Reform Group expressed concern about 'the apparent lack of progress towards a wholesale revision of what is universally acknowledged to be a seriously outdated Copyright Act . . .

'We are totally committed to the cause of copyright reform, not at some ever-receding point in the future but as a matter of legislative priority . . .

'We pledge our resources to assist the Government in completing the appropriate legislation in time for its introduction into the 1984-1985 session of Parliament.'

Margaret Spooner

Duplex acoustic-coupler

Micro-Myte has introduced a duplex acoustic-coupler operating at a true 1032-baud.

A typical modem, with one start and two stop bits, transmits data at an average of less than 65 per cent of its stated baud rate, with five out of every eight bits being used for data transmission. The Micro-Myte 160 modem, in contrast, uses duplex error-detection and correction to enable all eight bits to be used for data transmission. Thus it operates at a true 1032-baud, rather than the average 48 bits/second of a 1200/75 modem, says Micro-Myte.

The Micro-Myte 160 cannot be used for accessing public or commercial systems, since it does not conform to industry standards. But for user-to-user communications, where both parties are using the modem, it can substantially reduce the cost of telephone calls.

The Micro-Myte 160 is available for the Spectrum and ZX81 now, and the Spectravideo, Memotech and NewBrain are next in line. Micro-Myte is also planning to support CP/M micros. The modem will retail for around £125, including software and VAT, from branches of Menzies, or direct from Micro-Myte.

The company expects the modem to be available by the end of May. Details on (0272) 299373.

Surya

New operating system for Apple II

ProDOS is the new operating system to enhance the Apple II when used with disks. It doesn't involve the purchase of any additional hardware.

ProDOS is fast. It always seemed strange that non-Apple alternatives to DOS 3.3 were so much faster; now Apple has caught up with the rest of the pack. The observed speed increase seems to be between 3-10 times, depending on the application.

Also nice is the support for hierarchical structures for disk directories, and a Pascal-type FILER for managing them. This in turn makes it practical to support hard disks with the Apple II; the standard version of ProDOS will support the Apple ProFile hard disk (which was previously only available with the Apple III).

Apple III compatibility is further enhanced because ProDOS is a subset of Apple III SOS (Sophisticated Operating System). This means that the II and the III will be able to work side-by-side on a network, as well as exchange files and read each other's disks.

Of course, the additional features of ProDOS do require additional memory. The impact of this on most applications has been minimised by putting the bulk of ProDOS in the Language Card (which is required, if you haven't already got one). In fact, the space available to Basic programs is about the same as it was under DOS 3.3. Converting files from DOS 3.3 to ProDOS is easy, using the conversion utility provided. Sensibly, Apple has given the utility the capability of converting from ProDOS to DOS 3.3, as well.

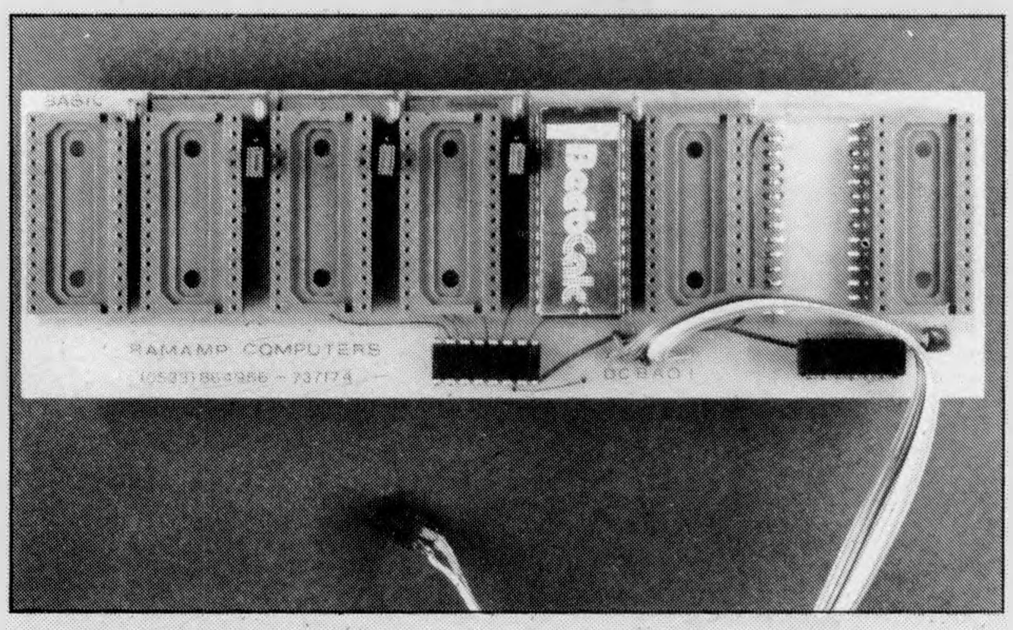
Apple has completely overhauled the machine code interface, meaning that it is much easier to write machine code for ProDOS than it was for DOS 3.3. This should mean a rapid availability of programs to run under ProDOS.

Like DOS 3.3 (and unlike CP/M), ProDOS will be on every disk sold to run under it, so most people will acquire it as a matter of course, when they purchase new software. (It may be purchased alone 'for a nominal sum', from your Apple dealer.) Also, it will be shipped with every new floppy disk drive, after the release date, so you may be confident that migrating to ProDOS will not make you incompatible with everyone else.

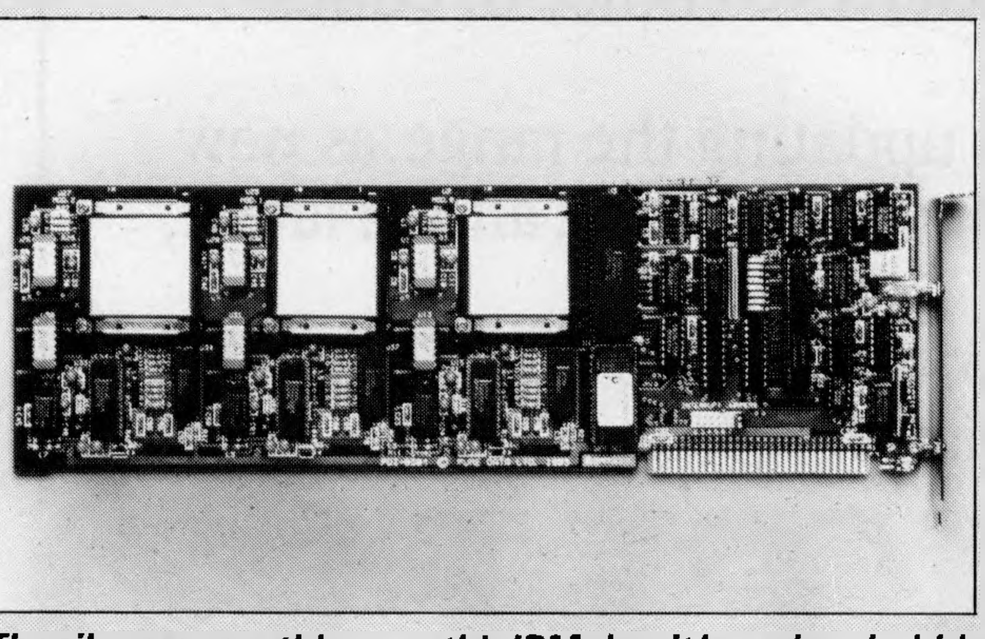
It is rumoured that Apple is working on a major new language specifically designed to run under ProDOS, which will be 'interactive, fast, and substantially easier to use than either Basic or Pascal'.

ProDOS offers considerable advantages to applications programmers but it is likely that DOS 3.3 will continue to be used for some time.

Chris Moller



Suffering from complaints that 'sideways' ROM extensions — programs which are plugged in together, but only work one at a time — are hard to put together by unskilled users of BBC Micros, Ramamp has produced an extension unit which is easy. Details on (0533) 864966.



The silver square things on this IBM circuit board are bubble memory circuits from Garingdell Systems. They provide up to 384 kbytes of bubble storage, with password protection so that anybody who doesn't know the password will find that the bubbles apparently contain only garbage.
Details on (0753) 883036.

Fuller redeems its image

Fuller makes proper keyboards for Sinclair computers, and expansion boxes. The company got a lot of bad publicity last year because supply didn't keep up with demand, and products were late — it refers to this episode as 'the embarrassing success of the FDS keyboard'. Now it reckons things are in control, and announces that the keyboard will take the Microdrive, too.

Guy Kewney

Lisp on Sage micros

Metacomco, a Bristol-based company specialising in 68000 systems software, has produced an implementation of Cambridge Lisp (CL) running on the Sage II and Sage IV microcomputers.

Cambridge Lisp was originally developed on an IBM mainframe at Cambridge University as part of a research project into computer algebra. It is currently being used to produce an implementation of Prolog, and a natural language research project — also at Cambridge University.

Metacomco describes its implementation of the language as 'the leading contender to become the international standard Lisp on microcomputers.' Employing a similar syntax to MacLisp, Cambridge Lisp runs Benchmark programs at what Metacomco describes as speeds 'comparable' to Franz-Lisp running on a VAX-11/750.

CL employs a built-in compiler to reduce program storage space and increase execution speeds. Other features include floating-point arithmetic, trigonometric functions, and tracing of both interpreted and compiled code.

Metacomco has also produced 68000 implementations of Fortran, Pascal and the Cambridge Ring operating system, Tripos. Tripos is a '32-bit' concurrent operating system incorporating both BCPL and a 68000 macro assembler.

Although Cambridge Lisp runs only on the Sage at present, versions for other 68000-based micros are expected. Details on (0279) 550756.

Surya



Japanese computer company Sord has entered the portable market with a lap-held micro running PIPS software.

The Sord IS-11 (the 'IS' stands for 'integrated software') is not made by Kyocera — unlike the Tandy, NEC and Olivetti portables — but is designed and manufactured by Sord itself. Although the hardware is similar to the Kyocera machines — 32k CMOS RAM, 40×8 LCD display, battery-powered — the IS-11 takes a different approach on software. Where the Kyocera machines use custom-written software, Sord has opted for PIPS — an integrated business package comprising spreadsheet, word processor and database, normally running under CP/M or MS-DOS. The version of PIPS running on the IS-11 is a cut-down one, but Sord is confident that the package offers enough features of the original to be taken seriously by business users.

The ability to run a familiar package on a true portable is a step in the right direction — at least, so far as the business user is concerned. Promised features include a program to convert IS-11 data files to a number of different file formats prior to uploading to a desktop micro. The formats to be offered are Lotus 1-2-3, Multiplan, VisiCalc, Supercalc, dBase II and WordStar. Some sort of CP/M emulator is also promised, though it's hard to see why anyone would want to emulate CP/M. Also included is a communications program which looks very similar to the TELCOM program of the Kyocera micros. No mention is made of a Basic interpreter but that probably won't deter business users.

On the hardware side, the Sord has a built-in micro-cassette unit similar to that of the Epson HX-20. It operates under software control at an impressive 2000-baud, in contrast to the 300-1200 baud of most computers using standard cassettes. Surprisingly, the processor is an 8-bit Z80A rather than the 16-bit 8085 of the Kyocera machines. Maximum RAM limit is 64k.

The IS-11 has an RS232 and Centronics port and provision for an internal or external modem. It is powered by a rechargeable battery, each charge giving approximately eight hours' life. An optional portable printer and clip-on numeric keypad will be available at the launch, according to Sord. At press time the UK price had not been fixed — a Sord spokesman could say only that the standard machine (including PIPS) would be 'under £1000'.

The IS-11 should be available by June. Details on (01) 930 4214.

Surya

British Microcomputing 'Oscars'

ACT emerged with a hat trick of firsts for the Apricot at the British Microcomputing Awards (BMA) 1984 ceremony organised by *PCW*'s publisher VNU in conjunction with *The Sunday Times*.

Other stars included Lotus 1-2-3, Concurrent CP/M, Acornsoft's word processor View, the adventure game Valhalla, Lisa's operating system, the Prism VTX 5000 modem, the BBC Micro and the Spectrum.

In *The Sunday Times* Special Commendations category two products were singled out. The Libra, launched at the BMA ceremony on 28 March, is a CP/M Braille system incorporating keyboard, display and voice facility. The VDU provides normal display as well as extra large characters for use by the visually handicapped.

Also commended was Alan Coode, headmaster of a Wimbledon junior school, for his commitment to computers in the classroom as an integral part of all aspects of education.

The British Microcomputing Awards aim to be the oscars of the microcomputing industry. They were presented at a ceremony attended by 320 eminent members of the industry and hosted by Ned Sherrin.

The opening speech was given by the editor of *The Sunday Times*, Andrew Neil. Neil drew an analogy between the 'vested interests' in Britain today and the Duke of Wellington who opposed the expansion of railways in the nineteenth century because they threatened to liberate the working people enabling them to move their labour about the country. He warned that micro entrepreneurs are up against the existing powers of big business, big government and big unions.

Neil welcomed the fact that the micro revolution is happening in Britain but he also noted that here the vested interests of the older establishments are more powerful than anywhere else.

Also launched at the BMA ceremony was Comet (Concerned Micros in Education and Training). 'Comet aims to examine what micros can do to counter the effects of peoples' disabilities and make their lives more productive and fulfilled,' said Tim Yeo MP, a patron of the project.

The BMA 1984 was organised by VNU and *The Sunday Times*. Its sponsors were Thames Television's *Database* and consultants VLI Computer People.

British Microcomputing Awards Table:

Personal Computer World
Microcomputer of the Year:
ACT's Apricot
VLI Computer People
Business Micro Award:
ACT's Apricot
MicroDecision
Business Software Award:
Lotus 1-2-3
What Micro?
Home Micro Award:
BBC Model B/Sinclair Spectrum
Computer Answers
Creative Software Award:
Lisa's operating system
Personal Computer Games
Game of the Year:
Valhalla
The Sunday Times
Special Commendations:
The Libra from Erleybridge Braille Systems; Alan Coode of Southmead Junior School, Wimbledon
Personal Computer News
Peripheral of the Year Award:
Prism VTX5000
Thames Television's *Database*
Software of the Year Award:
Concurrent CP/M/Lotus 1-2-3
Sunday Times
Award for British Innovation:
ACT's Apricot

Jane Bird

Three c amn





A rubbish bin for your old has been.

Yet more money bol

■ Believe it or not, computers often suffer from amnesia.

99% start off with large enough memories, but operating functions like text, colour, sound and more particularly high resolution graphics, take large bytes out of them. Leaving very little "useable" memory for programming and games.

Not so the new Oric Atmos 48K.

This is the one home computer that takes these normal working functions in its stride.

Unlike other home computers it uses the highly sophisticated serial attribute handling method used by Viewdata and Teletext, in which the attributes are stored on the screen alongside the data, instead of taking up space in the memory.

Thus the Oric Atmos never offers less than a healthy 37K of useable memory – even when the new colour printer and disc drive unit are attached. (Technical buffs see details overleaf).

So it rivals the performance of the supposedly larger, more expensive Commodore 64K, which unfortunately loses 26K of its "elephantine" memory in high resolution graphics.

It beats its immediate competitors like the Sinclair Spectrum, Dragon 32K, Vic 20 and Atari 600.

ures for esia.





for yet more
ons.

The new Oric Atmos 48K.

It beats the Lynx 48K,which costs over a third more, yet loses 34K.

It even beats the Acorn Electron and the BBC Micro which costs more than twice as much, yet loses 23K in high resolution graphics.

And while this may surprise you, it's totally in keeping with a company recognised in the computer industry for performance and innovation.

Like its predecessor, the Oric-1, the Oric Atmos has the powerful loudspeaker and amplifier unit that prompted "Which Micro" (November issue) to comment..."Its sound facilities have more in common with those of the £400 Beeb, than the rather pathetic beep of the Spectrum. At full volume it can compete with most arcade games..."

Yet the Oric Atmos 48K costs a mere £170, including all the leads and adaptors you need to get it going.

So if you're buying a computer, remember our name. We could save you a fortune on bolt-ons... or wastepaper bins.

The new Oric Atmos 48K. ORIC

Now we've whetted your appetite, here's something to get your teeth into.

Printer Technical Specifications

Printer/ Plotting system	Ball Point Pen, 4 colour
Plotting speed: (horizontal) (vertical)	52 mm/sec (2.05ips) 73 mm/sec (3.08ips)
Printer Speed	12 characters per second
Resolution	0.2 mm/step (0.00787 inch)
Effective plotting range	96 mm (3.804 inch) x axis, divided into 480 steps. (No limit in y direction)
Characters per line	80 or 40 text mode (determined by software in graphics mode)
Characters per line	INT (480/n+1) *6) for 0=n=15
Accuracy (repetition) (movement) (distance)	0.2 mm max 0.3 mm max 0.5% max (x–axis) 1% (y–axis)
Pen life	250 metres (825 feet)
Parallel interface	8–bit parallel Uses STROBE and ACKNOWLEDGE
Temperature range storage	18.3 to 35°C (65 to 96°F) –40 to 71°C (.40 to 160°F)
Humidity range	10% to 80% relative non-condensing
Power supply	Switching power supply input 100–120 VAC 200–240 VAC
Dimensions	10¾" wide 6⅞" deep 2½" high

Atmos Technical Specifications

CPU	6502 A
Memory	Choice of 16K or 48K RAM
Memory (48K Model)	Minimum 48K RAM, max 64: 16K ROM external control signals allow use of full 64K RAM or maybe used externally to increase ROM/RAM
Language	Extended Microsoft basic
Keyboard	Typewriter style and pitch. 57 keys, standard computer layout, additional cursor control keys, autorepeat facility, tactile and acoustic feedback
Display	Output for B&W or colour TV, RGB output for colour monitor.
Text format	40 line x 28 rows
Character set	Similar to Teletext format, standard ASCII double height, flashing, 80 user definable characters
Graphics	240 x 200, 8 colours
Graphic Facilities	Points, lines, circles
Sound	Internal loudspeaker and amplifier. 3-Channel sound synthesiser envelope control, amplitude control 8 octaves, noise channel
Storage	Most cassette recorders via DIN socket 300 or 2400 BAUD. Disc Drive.
Interface	Centronics, expansion port, Hi-fi, RGB Monitor, UHF TV, cassette recorder
Other	Warm reset to regain control without clearing program or data

Micro Disc Technical Specifications

Formatted Capacity	160K bytes per side (double density as standard)
No. of Tracks	40 (80 available as option at a future date)
No. of Sectors	16
Bytes per Sector	256
Transfer Rate	250K Bits/Sec

Supports up to 599 files per side, four drives single or double sided, 40 or 80 track. User definable configuration allows mixing of drive types including 5 ¼" (five and a quarter inch)
Extensive wild card facilities
Copy allows merging of basic and machine code files

Utilities

The Utilities are as follows:

1. Backup	Copy a whole disc
2. Copy	Copy a file to another
3. Del	Delete a file allowing wildcards
4. Dir	Display directory listing
5. Drv	Set the default drive number
6. Format	Format and initialise a disc
7. Load	Load a file (code data or basic)
8. Protect	Change protect status of file
9. Recall	Recall a basic array from a file
10. Ren	Rename a file
11. Save	Save a file (code, data or basic)
12. Store	Store a basic array as a data file
13. Sys	Change system configuration

Prices and data correct at time of going to press.
Specifications on the above models may change without notice.

Available at Allders, Currys, Dixons, Greens, Harrods, Laskys, Rumbelows, Spectrum and Zappo Computer Centres.



ORIC

NEWSPRINT

STOP PRESS

Amstrad Benchtest – (p170)

The original marketing plan to keep the basic machine as bare and plain as possible, with absolutely no accessories, has been rethought and a disk will be available around July.

The result will be that the Amstrad will be the cheapest CP/M micro on the market.

There will be a £400 system with a green monochrome monitor and a single Hitachi drive, including CP/M 2.2 plus the programming/teaching language, Logo, also from Digital Research.

And for £500, the same system, but with a colour display, will be available as a 'top of the range' model.

It was not possible to obtain a sample disk for the Benchtest; this will be covered in a future issue of *PCW*. However, the Hitachi drives are known to be reliable, and the only drawback is that there are many programs on CP/M which don't come readily available on 3in diskettes.

However, once there are a few thousand Amstrad systems with CP/M, I predict that there will suddenly be an interesting supply of software for the new format.

Guy Kewney

NUMBERS COUNT

Diophantine Equations

The topics dealt with in this column attempt to reach the frontiers of knowledge in number theory with the minimal background information. The problems posed therefore have no complete solution known to the author, and readers are encouraged to submit their attempts at solution, however incomplete they may seem.

Those readers who have been with us since the first Numbers Count back in February 1983 — 'Waring's Conjecture and a certain Diophantine Equation' — will recall that a Diophantine Equation is one which is solved in terms of integers only.

The first writer to study such equations in detail was Diophantus of Alexandria *c* 250AD. For example, the equation $x^2 y^2 = z^2$ yields the integer sided right-angled (or Pythagorian) triangles beginning with (3,4,5) and (5,12,13).

Problem

Here are three distinct problems in this field, indicating fundamental differences in the state of the art relating to each. Readers are invited to contribute.

(1) Consider $z(1 + xy) = x^2 + 2y^2$; this has only one known solution in integers, namely $x = 30905$, $y = 663738$, $z = 43$ due to ES Barnes, *J London Math Soc* Vol 28, 1953 pp242-244. Further, LJ Mordell in *Diophantine Equations*, Academic Press 1969 writes: 'The only procedure seems to be to try if there is a solution for various values of z.' How does one best do this trying, and do we need all values of z?

(2) Consider $6y^2 = (x+1)(x^2 - x + 6)$ (those readers familiar with the Binomial Theorem will recognise this as $y^2 = 1 + x + x(x-1)/2! + x(x-1)(x-2)/2!$). This is known to have integer solutions for $x=2,7,15$ and one other non-trivial value of x ($x=0$, and $x=-1$ are regarded as trivial). Find the fourth non-trivial x-value: it has only two digits — are there others?

(3) The Arabs *c* 972AD are believed to have been the first to study the pair of simultaneous Diophantine Equations

$$y^2 = x^2 + 5u^2.$$
$$z^2 = x^2 - 5u^2$$

The solution $x=41$, $y=49$, $z=31$ and $u=12$ was published by Leonardo of Pisa 1220AD. A further solution $x = 3444161$, $y = 4728001$, $z = 113279$ and $u = 1494696$ is known, as is a yet larger solution involving 15-digit integers.

Theoretically, this problem is completely solved because algebraically every solution may be derived from Leonardo's by rational operations. See Uspensky and Heaslet, *Elementary Number Theory*, McGraw Hill 1939 pp419-427.

How efficiently can the above solutions be found using a computer? Readers are invited to submit a program, or suite of programs, to investigate the above questions. All submissions should include program listings, hardware descriptions, run times and output; they will be judged for accuracy, originality and efficiency. A prize of £10 will be awarded to the 'best' entry received by 1 July 1984. Please address all correspondence to Mr MR Mudge, 'Square Acre', Stourbridge Road, Penn, Nr Wolverhampton, Staffs WV4 5NF.

Absolute differences of Prime Numbers — December 1983

This problem proved to be exceptionally popular, attracting multiple responses from Belgium and West Germany. The languages chosen included VSAPL under CMS in a 2Mbyte virtual machine of a 4Mbyte IBM4331/2; Pascal on an Altos ACS 68000 with the Unix System III in multi-user mode; C-language on an IBM Personal Computer; Basic on an Acorn Atom with 29k of RAM but with a 7-track ½in tape drive interfaced to give mass storage with a transfer time of around 4k per second.

The prizewinner however, after a very careful evaluation, is Michael Robinson of 2 Lower Merrion Street, Dublin 2 who addressed himself precisely to the problem as posed. Using Cobol written for a 16-bit micro, with assembly routines for the repetitive parts, the program was ultimately run on a Burroughs B22 up to $a_{110} = 103961$ and then in mortuary time on a B21. A very careful operations estimate was included and the entire study well documented. $a_{64} = 5940$ was reached in 4mins 42secs from approximately 6000 primes, the study being terminated at $a_{146} = 733576$ in 27hrs from 786575 primes, the last of which was 11975597. Empirical evidence for the Gilbreath conjecture is considerably strengthened by this computation, revealing, for example, that around $a_{126} = 271621$ large differences are seen 'spreading like ripples in a sea of 0s and 2s.'

Perhaps those who submitted studies of this problem could communicate one with another either via Michael Robinson or myself, with a view to a final assault on the a_n and its associated number patterns? END

Note. Submissions can only be returned if a suitable stamped addressed envelope is provided. Telephone comments, both favourable or otherwise, are welcome on (0902) 892141.

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 Peter Bright (see 'Computer Answers' page). Address letters to 'Communications,' Personal Computer World, 62 Oxford Street, London W1A 2HG.

Copyright optimism

Computer Answers in the March issue of *PCW* includes a letter from Dr Richard Carruthers, which suggests that by registering a program as copyright in the States, a person can rely on the Universal Copyright Convention to ensure that copyright protection extends to the UK. Sadly, the position is not so simple.

To derive any protection whatsoever that person should either be a US citizen, or the work to be protected should be first published in the States. It is also necessary for the work (and any infringing copies) to be in a form 'from which it can be read or otherwise *visually* perceived.' (UCC Article VI).

Most importantly, the UCC only provides to the US copyright holder the protection already afforded to a British subject under the British copyright laws (Article II). The UCC does not extend US copyright law to Britain, and does not therefore provide the panacea required.

However, I think your correspondents are unduly pessimistic in continually emphasising the uncertainty said to surround program copyright in Britain. The 1977 Whitford report on Copyright and Design Law concludes that the existing categories of literary (and where appropriate) artistic works are sufficiently wide to cover computer programs. Moreover, the English Courts have shown themselves in some half-dozen decisions (albeit interlocutory only) very ready to assume that copyright can exist. For example, Mr Justice Goulding in 1982:

'On the evidence before me in this case I am clearly of the opinion that copyright under the provisions relating to literary works in the Copyright Act 1956 subsists in the assembly code program of the game "Frogger". The machine code derived from it by the operation of part of the system of the computer called the assembler is to be regarded, I think, as either a reproduction or an adaptation of the assembly code program.'

Quite apart from the judicial trend it seems entirely clear that cinematographic copyright can exist in the visual images displayed on the screen, so if the displayed result looks the same as an original work it becomes immaterial by whatever route that result was reached. This may well provide an unambiguous and clear cut cause of action.

Because of this favourable judicial climate, the advice to any potential plaintiff would have to be to present the most aggressive front possible and to sue on all possible counts. It's a brave and foolhardy defendant who is not prepared to settle if he knows that his program is a copy of the plaintiff's work or is largely derivative. Interlocutory proceedings are not prohibitively expensive for a plaintiff company and the action is unlikely to go beyond the interlocutory stage, except in the very few cases of genuine doubt. Such doubt could, I suppose, be said to exist in relation to programs which have been compiled using, for example, a proprietary computer, or programs which have been subsequently cross-compiled. However, the skill and effort of the author have still been utilised within the compiled/cross-compiled version: I would be surprised if the Courts were to find against a plaintiff in such a case.

Finally, it should be borne in mind by authors and software houses alike that although computer programs as such are not patentable, it is possible to patent a computer when conditioned by a program to operate in a particular way or to achieve a particular object. Patent protection is therefore possible, but probably not for something as 'trivial' as a new game.

MA Lynd, Godalming, Surrey

(Sorry, but I'm not quite so optimistic. Software copyright must be clarified in law. It is not enough for plaintiffs to rely on getting a settlement out of court. See page 232 — Ed)

No injunction

I was interested to read in the March 84 issue of *SOFT* that: *'Acorn User* . . . has not had any injunction slapped on it by the High Court for its February issue, the one carrying very complete details of Acorn/BBC tape file locking methods, plus details of the sort of alternative locking planned by Acornsoft for future tapes.'

I also note that *Acorn User* is owned by Chris Curry!

AL Gothard, Bolton

(Odd, isn't it? — Ed)

Quantum mystery

In our universe, the smallest finite change in energy which a physical system can experience is called a quantum jump, or leap. Fortunately, the quanta involved are so very tiny that their finite size is not noticeable except in sub-atomic processes.

Can anyone suggest a reason why, given this background, the term 'quantum leap' is used colloquially to imply a very large change indeed?

John Shade, Step-One Data Services, Angus, Scotland

(Had we but known it, the QL's marketing secret was contained in its name. Our dictionary defines quantum as 'a naturally fixed minimum amount' — Ed)

Latin leap

The Sinclair QL may well be a 'quantum leap', but it appears to be a leap backwards rather than forwards. According to the advertisement feature accompanying the February issue of *PCW*, the section of the manual covering the Microdrives is written in Latin.

Not only that, but as far as I can tell, it doesn't even make sense in Latin.

Trevor Marshall, Horsham, West Sussex

(See ChipChat for some inspired guesses at Sinclair's intent — Ed)

Informing on reliability

In all its reviews and Benchtests, *PCW* ignores the factor of greatest importance to users: reliability. Of course, reliability cannot be assessed in the short tests typically performed by your contributors, but in view of its overriding importance, that's not an excuse for ignoring it.

Here's a suggestion. For products which appear likely to be value-for-money leaders in their class, ask readers to notify *PCW* when they order the product: all you need do is keep track of the numbers of each one ordered.

Those whose equipment fails within a year notify you again. You publish the percentage of non-working systems, month by month, for each of the monitored products.

It's not necessary to monitor a great number of products; half a dozen would be enough to start with. Revealing the truth about some of the shoddy products on the market would not endear you to all your advertisers, but it would increase *PCW*'s value to its readers enormously.

NJD Jacobs, Bradfield, Berks

(Tell us about poor reliability or bad service when it happens (see Oric story below). If you wait a year, many more people may have put good money after bad — Ed)

A lesson to be learned?

The March edition of *PCW* carried an advertisement for the Atmos 48k from Oric, in which it claims to have a better product than a number of named competitors. I notice no claim is made for reliability.

I purchased an Oric-1 for Christmas and it lasted six hours. The unit was replaced by the retailer and gave intermittent service for two months. Unit three was returned to the retailer the same day. I am now into unit four with little hope of its survival. But for a heavy commitment to supporting software, I would be seeking a reliable replacement.

It would appear wrong for a new product to be offered for sale when the market is still suffering from the effects of a defective product. I trust that prospective purchasers will be more aware of the situation than I have been.
TA Gilhooley, Blackpool

Stack light pen

I read with interest Tony Hetherington's article on the Stack light pen in the March issue of *PCW*. I now have one, after a long-running saga with DAMS Office Equipment (DOE) of Liverpool. Firstly though, I would like to point out that the Stack pen's poor resolution is not caused directly by the width of the sensor, but because the Commodore 64 uses only one byte as a pen register for each axis. This limits the resolution to 255 horizontally, thus allowing only two-pixel resolution to be stored.

I originally ordered a light pen from DOE in August last year. When I hadn't received it in October (after repeated phone calls), I asked for a refund. Many phone calls later (and a recorded delivery letter), I went to the Trading Standards Department. After it had written three letters without any acknowledgement whatsoever, I phoned again at the end of January. This time, I actually got an apology from a Mr Paul Nelson and a promise of a refund that week.

Two weeks later (still no refund), I threatened the company with a solicitor and promptly received a light pen two days later!

After all that time, this pen turned out to be far inferior to the Stack pen, having no form of data entry control at all, and being much less sensitive to colour.

With companies like this around, is it any wonder the British economy is in such a poor state? I will never buy anything by mail order again, and advise others not to either.
Mr D Corbett, Hayling Island, Hants

(Many feel the same, which is why the market is tending towards the High St shops — Ed)

The problem with binders . . .

You certainly deserve your chosen accolade: 'Britain's biggest microcomputer magazine.' I'm not certain of circulation figures, but any magazine of nearly 400 pages cannot fail to be 'big'. Indeed, your binders could probably claim the title of 'Britain's biggest binders', but it's here that the problem lies.

Binder size has clearly grown in an effort to match issue size, but has not grown fast enough. My Vol 5 binder, for instance, can contain only 11 of the 12 issues, and Vol 6 only 10. Admittedly, you make no claim that each binder *will* contain 12 issues, but since they do contain bindings for 12 issues, I assume one volume per binder is the intention.

I suggest one of the following:
(i) The issues are made smaller by decreasing the number of advertisements (perhaps not economically viable?).
(ii) The binders are made longer (though I'm not sure they could then be lifted).
(iii) Make the binders a sensible fraction of a volume (half a volume, perhaps) for easy labelling.

I don't suppose any one of these is a particularly good solution, but it's infuriating to have a set of bound magazines with a few issues laying loose because they 'wouldn't fit.'

While on the subject of volumes, may I also request that the last issue of each volume contain an index for that volume — something like the guide in Back Issues, but preferably alphabetic and more comprehensive, giving page and issue references.

I hope some of these suggestions are useful; the magazine is otherwise excellent. It had a tendency to be a little too business-oriented, but now seems reasonably balanced towards most micro interest groups. Not only that, it's the only micro magazine looking to the future and considering possible new uses for micros. It's also the only non-sexist micro magazine around. Keep up the good work!
Martin Wykes, Erith, Kent

(I've discussed these issues with the publisher whose decision will be binding — Ed)

Buzzbox success

I am a very satisfied DaCom Buzzbox user.

I have made a number of calls to various bulletin board systems and have had very few problems. In fact, I'm using a terminal program which I managed to download with only two or three easily corrected errors (not bad for a 7k long program). The review in *PCW* helped me decide on the Buzzbox rather than trying to build the Maplin modem.

Keep up the good work at *PCW*!
Brian D Smith, Camberley, Surrey

(We'd like to review the Maplin modem too, but the British Approvals Board for Telecommunications isn't too fond of kits. Watch Network News — Ed)

Sensible language

Peter Amey's plea for a sensible language (*PCW*, March 1984) appears to be met in all respects, except one, by APL. The one thing lacking is a compiler option which is not generally available, although it has been the subject of two or three research papers in the last couple of years. Interpreters are available for some machines using the 68000 chip, for certain machines which operate under Unix (Dyalog APL), and at least three versions for the IBM PC. If you are stuck with CP/M you might try VIZ::APL. When the BBC's Z80 second processor is available you will be able to get Acornsoft APL.

The language is powerful, yet simple. At first sight one might be put off by the strange symbols, but you soon get used to them, and software can be written so that the end user only needs to use English language commands. APL has been adopted by big businesses and we should now see it coming into much greater use on micros in smaller businesses, schools and colleges.

The interpreter for Dyalog APL is written in C and it's easy to incorporate your own special functions written in this language. Other interpreters, such as APL 68000, allow similar incorporation of Assembler routines.

I do not suggest you throw the other languages away, but do suggest that you'll find using APL a lot more fun, as well as cost effective.
Prof Alan G Hawkes, University College of Swansea

(Who'd have thought it? A consensus emerged from PCW readers that APL is the 'sensible' solution — Ed)

Offensive ads, Victorian ideas

Congratulations to Bob Almond for taking the trouble to write and complain (Communications, March) about the offensive advertisement he saw in *PCW*, and congratulations to the editor for her response. I didn't see the advert, but had I done so I, too, would have complained.

There may have been a lot wrong with Victorian ideas, but it doesn't follow that the prevailing attitude today is necessarily better.
Chris Price, St Andrews, Fife

Design

I was unpleasantly surprised when I received my February issue of *PCW*. What I liked very much about your magazine (as opposed to *BYTE*) was that the ads were separated from the text and I could read one without being bothered by the other. Now you have changed this. Was it really necessary? You seemed to be doing well enough, or is it that every computer magazine has to be like *BYTE*?

I'd like to think you'll return to the original format, but I'm afraid you won't. It's a shame.
Axel Unterschuetz, Kiel, West Germany

(Miracles sometimes happen! — Ed)

END

YANKEE DOODLES



Portrait by Eddi Gornall

David Ahl is an eminent figure in microcomputing. In 1974 he founded one of the leading US micro magazines, *Creative Computing*. He has worked for AT&T and Digital Equipment and has written extensively about micros, especially regarding their use in education.

We're not ashamed to admit we took a look at *Creative Computing* when *PCW* was re-designed and we're pleased to report that David will be writing for *PCW* every month.

Random rumours

As a result of a shortfall in sales of the Adam, Coleco has laid off 50 of its headquarters staff . . . Tandy has introduced a disk drive and video interface for its Model 100 notebook portable computer: not mentioned is the fact that the disk has sequential access (like a cassette tape) rather than random access (like a standard floppy disk) . . . Mattel has left the electronics business completely with the sale of marketing rights to its game system to Intellivision, Inc. . . Victor Computer, maker of the Sirius 1, filed for protection from creditors under Chapter 11 of the federal bankruptcy laws . . . Acorn has won a contract to supply 175 BBC computers to schools in Phoenix, Arizona, beating Apple and Atari.

Amiga to use 68000

Amiga has been most secretive about its Lorraine home computer. Although it had a huge stand at the Consumer Electronics Show last year, the computer was hidden in a closet and shown only to selected customers.

Amiga has now disclosed that the machine will use the 16-bit 68000 microprocessor (the same as in the Apple Lisa and Macintosh) and will include 128k of RAM and a 320k disk drive. With a projected retail price of $600-$700, the Lorraine will be the least expensive 68000-based machine on the market. It is claimed to have optional IBM PC compatibility, making it even more attractive.

Amiga currently markets joysticks, a foot control platform and video games for home computers and Atari game systems, but it expects the computer to be its major product in 1984.

Cool reception for IBM PC Junior

When it was announced last fall, the IBM PC Junior had the entire industry talking about IBM's impending dominance of the home market. But it hasn't come to pass.

Everyone admits the PC Junior is reliable and, with expanded memory, is able to run most IBM PC software, but that's about the end of the praise. The major minus appears to be the keyboard. Many users complain that the little rectangular keys are too far apart for touch typing and that the labels above the keys are difficult to read. Others feel that it's far too expensive for a home computer but not powerful enough for most business applications.

Still, most dealers say they are waiting to see how it fares in the months ahead, particularly against the Apple IIe, a well-established product at about the same price. Many people feel that for the money, the Apple offers a great deal more, both in the hardware as well as third party software and peripherals. Portable and expanded versions of the Apple expected later this year will add even more to its appeal.

Nevertheless, the PC Junior has three invaluable assets: the letters I, B and M.

Timex abandons computer market

Timex, Sinclair's US partner, recently quit the computer market. The privately held firm disclosed that it had over $100 million of losses in 1983 and, anticipating further price erosion and margin decay, decided to get out altogether.

Many observers fault Timex for not introducing the Model 1000 (equivalent to a 2k ZX81) for nine months after it was available in the UK. Also, Timex redesigned the Spectrum slightly, called it the Model 2068, and again delayed its introduction by nearly a year. Moreover, the redesign made it unable to run Spectrum software, making the machine less attractive because of the substantially reduced availability of third party software.

The exit of Timex is believed to open the way for Sinclair to re-enter the US market if it chooses to do so. An informal poll among readers of *SYNC* magazine (the major Sinclair magazine in the US) indicates strong support for the re-entry of Sinclair.

Ironically, Timex plans to continue manufacturing computers for Sinclair in Scotland under an OEM agreement even though, for cost advantages, Timex was making the 2068 in Korea.

Computers coming home

An 'Intent To Buy' survey was recently conducted among households representative of the US population. In future spending plans, telephones are at the top of the list, perhaps a natural outcome after the recent anti-trust breakup of the Bell Telephone System.

Personal computers are in the spending plans of 9% of all households; this represents a 17% increase from the previous quarter. Moreover, peripherals and software ranked high in consumer spending plans: packaged software was listed by 7.7% of all households, printers 5.8%, blank disks 4.5%, disk drives 3.6%, additional memory 2.5%, monitors 2.2%, and modems 2.1%.

Softcon off to shaky start

The first Softcon was held in New Orleans from 21-23 February 1984. For many vendors and visitors, it will be their last.

On the final day of the show, the *Softcon Show Daily* reported: 'After a slow start, Softcon got rolling yesterday with attendance figures comfortably above management forecasts.' If that were true, the management forecasts must have been revised downward several times. Last October the show organisers forecast attendance over 25,000; by January the figure had shrunk to 10,000.

Although members of the press loved the show because there was plenty of time to see products and talk to software designers, the exhibitors were less enthusiastic. I spoke to many who were happy to show off their wares, but lamented that their audience was largely other exhibitors and magazine representatives. Although some thought they would give the show another try (after all, Comdex took several years to really get going), many felt it was a waste of time and money, and indicated they wouldn't be back.

Bookstores increase software sales

Walk into any bookstore in a major US metropolitan area and you are greeted with shelves and tables of computer books. At a New York B Dalton store (one of the largest US bookstore chains) the front tables, previously reserved for best-selling novels and seasonal books, are now devoted to computer titles. Moreover, many of these books include a disk of software.

Prentice-Hall is now distributing a series of books, *'The Power of:'*, produced by Management Information Source. Each of these $28.95 books focuses on a subject such as Multiplan, Lotus 1-2-3 or financial calculations with VisiCalc and includes a disk of software. Prentice-Hall is the first major publisher to distribute such books, but many smaller publishers have one or more titles available.

The bookstores are not totally committed to the software market yet. They complain that much software comes wrapped in packages that cannot be opened so customers cannot browse through the text material. Ronald Jaffe, software marketing manager for the Waldenbooks chain says: 'We need software that can sell itself, similar to books.' And a spokesman for B Dalton agrees that the software industry still doesn't have the kind of packaging preferred by bookstores.

END

'THE COMPANY COMPUTER' VS THE PERSONAL COMPUTER



Businessman Smith wants a microcomputer system for his smallish but buoyant company.
He buys a typical Personal Computer to start things off. It costs him about £3,000.

Businessman Brown, with a similar problem and a prudent eye on the future, opts for the Sage. It costs him £6,500, but it does have 4 times the capacity and can handle up to 6 users.

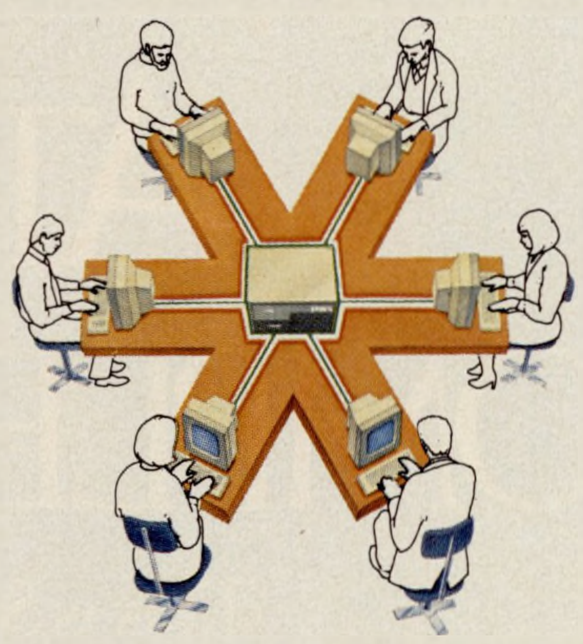
In no time, Smith's staff have taken to computing and want a second machine – another £3,000.

Brown too organises a 2nd work-station – he only pays £595 for an additional screen and keyboard.

Both bosses are asked to supply printers. Smith has to buy two for his PC's, Brown only needs one because his Sage was designed for sharing.

Business is good for both companies, but whilst Brown's bill for a 6 user system is £11,000, poor Mr. Smith has forked out just over £21,000.

And his troubles aren't over yet...
Because his staff need to share the company's information, it's going to cost him at least an extra £4,500 to network his system together. What's more, his dealer has recommended he does it with a Sage!



Vital statistics

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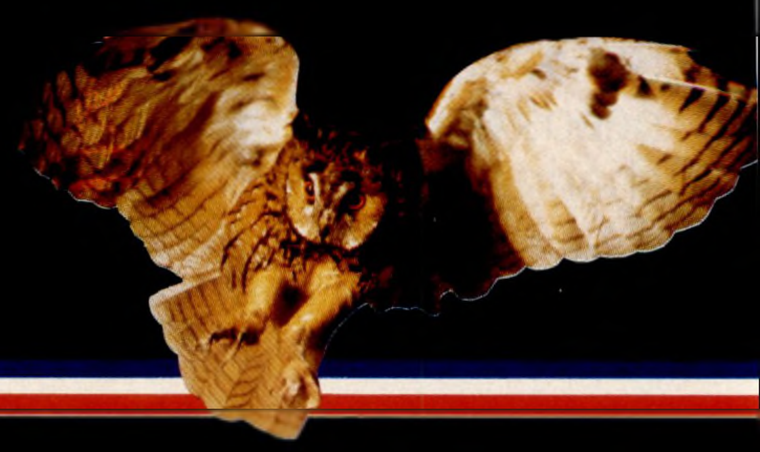

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Concurrent CP/M

The battle to attract 16-bit applications packages continues and Digital Research again enters the fray with Concurrent CP/M version 3.1. This powerful operating system allows up to four applications to be run simultaneously and support PC-DOS applications. Peter Bright reports.

How often have you tried to compose a letter on your micro and found that the information you want is sitting in another file somewhere else in the system? Rant and rage no more, Concurrent CP/M is here!

Most single-user micro operating systems can only handle one job at a time. So, in the above example you would have to close down the word processor, load the file, find the information, reload the word processor and carry on with your letter — all very long-winded and very slow.

Concurrent CP/M overcomes this problem by allowing different programs to run at the same time, while providing the opportunity to switch between them virtually instantaneously. The switching is achieved by the use of 'virtual consoles': for example, I am writing this article on an ICL machine running Concurrent 3.1. If I want information from a spreadsheet, I hit function 1 and the WordStar display is replaced by a display showing the CP/M 'A>' prompt. I then load the spreadsheet, receive information and hit function 0; and the display returns to WordStar.

It's important to remember that when you switch out of one virtual console the program you are running keeps going — you just can't see it. This is the multi-tasking element of Concurrent — up to four programs running at the same time.

To handle these jobs the machine must have some method of dividing processor time between each job. A combination of two methods is used: time slicing and I/O. If all the programs are processor-dependent then the system will give each job an equal time slice. However, most programs spend a great deal of time waiting for I/O to the screen, keyboard or disks. If one job is performing I/O, the system will allow the next job to jump in to use the processor.

As the processor has to run up to four programs instead of one, each program will obviously run slower than if it had been run as a single task. The extent of the speed overhead depends on the programs that are running. If you are running four processor-dependent

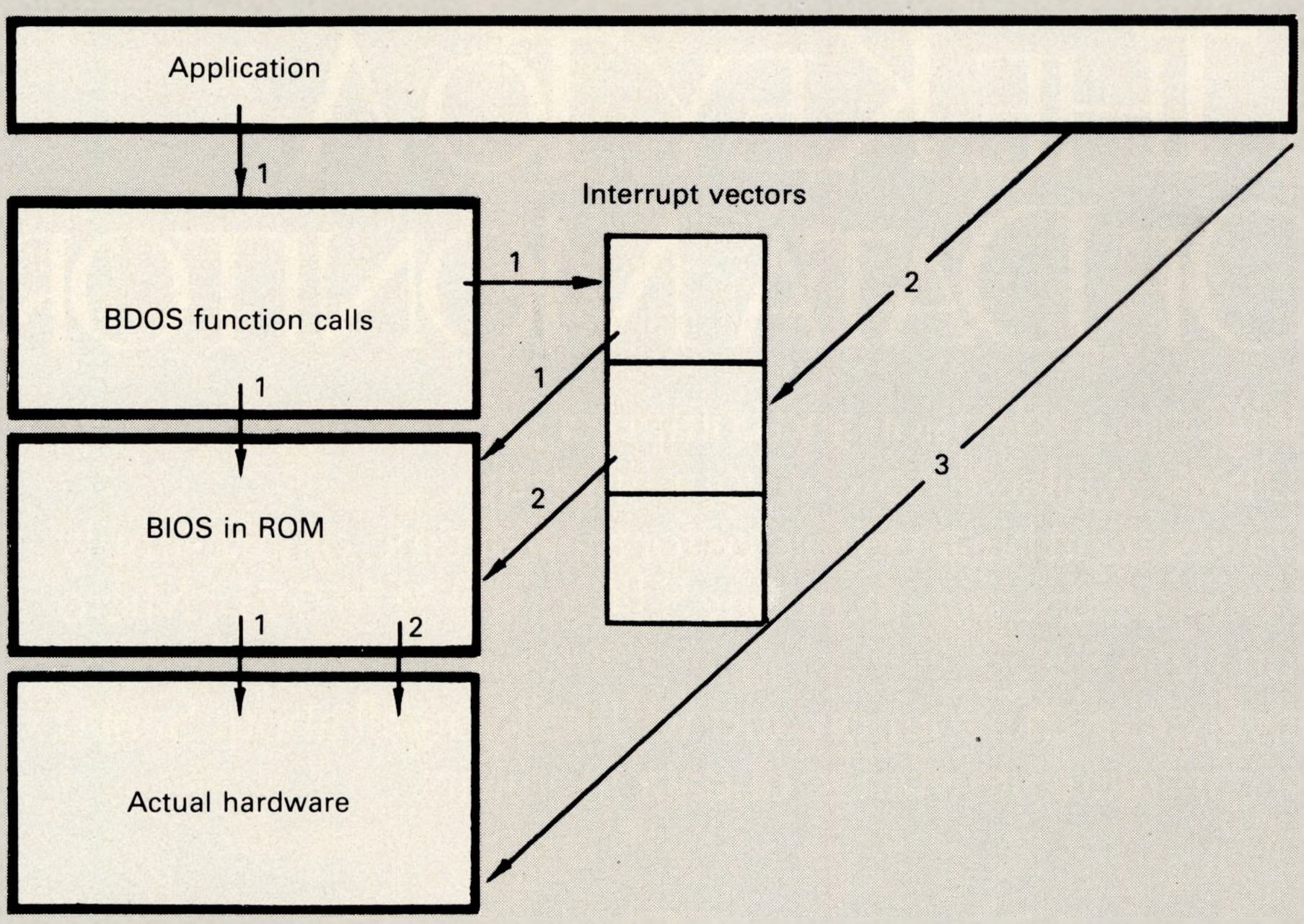


Fig 1 PC-DOS works at four main levels

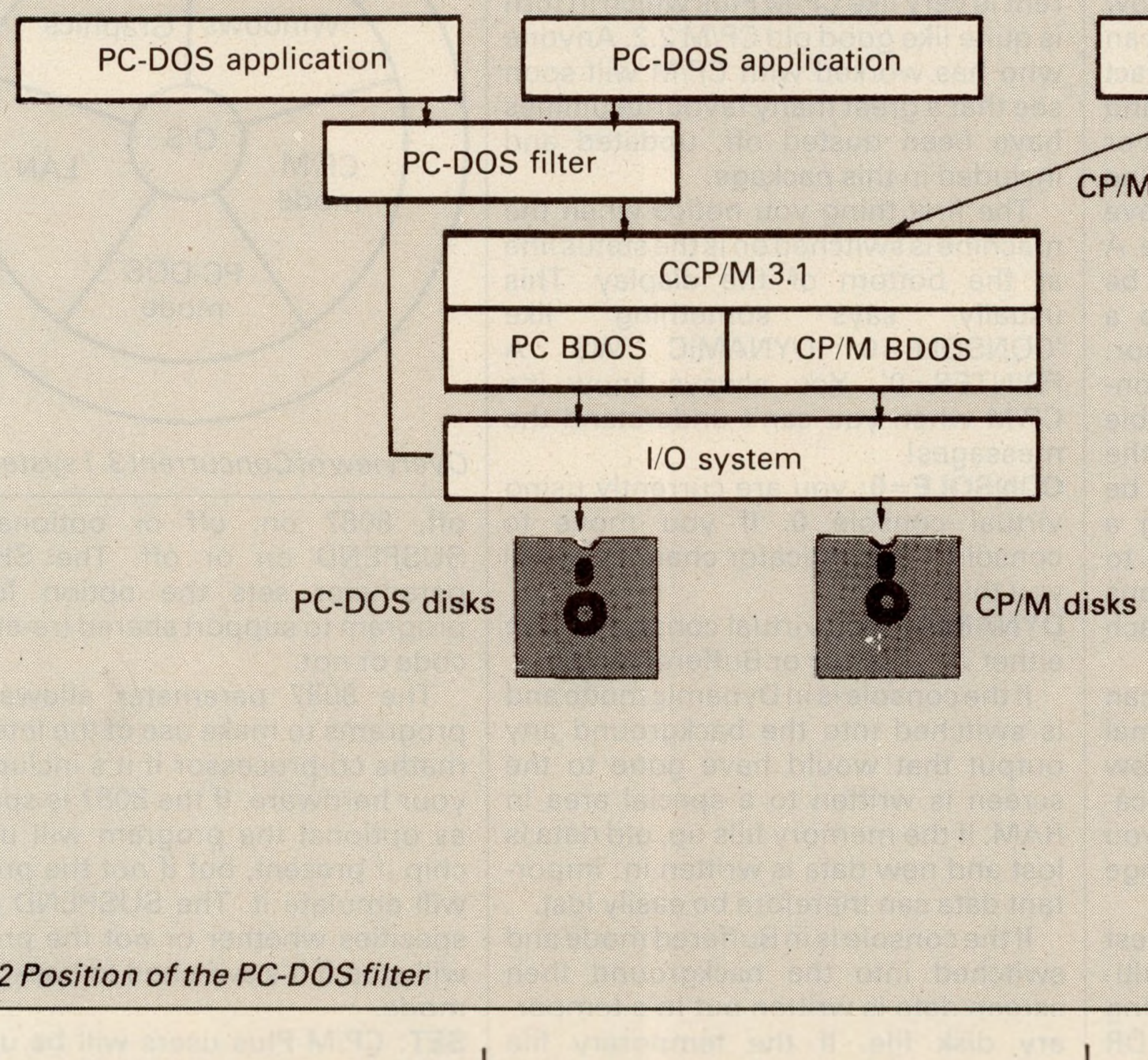


Fig 2 Position of the PC-DOS filter

jobs, they will run slower by a factor of four: this is an extreme case, usually the overhead won't be that high.

Features

In addition to running more than one program at once, version 3.1 is able to emulate PC-DOS, act as a multi-user system, run a windowing facility and interface to a local area network.

One of the most interesting features of Concurrent 3.1 is its ability to run programs designed to run under version 1.1 of PC-DOS on the IBM PC. Concurrent can't fully cope with version 2 of PC-DOS yet because of the hierarchical directories it employs.

This is the first time CP/M users have (in theory) been able to run PC programs; it potentially opens up a wide range of software for their use.

PC mode is not implemented on the ICL so I tried it out on an IBM PC. The thought of an IBM PC running Concurrent CP/M and emulating its own native operating system seems rather strange, but this is where Digital research (DR) is hoping to sell most units.

To understand how PC mode works it's useful to look at the workings of PC-DOS. Fig 1 shows the four main levels: at the top there's the applications program; below that is the BDOS and below that the ROS. The ROS is the ROM-based BIOS that gives the IBM-lookalike makers' problems, as they are not allowed to directly copy the ROS ROM and have to write their own versions. The lowest level is the actual hardware.

Applications programs access the system in different ways. 'Well-behaved' programs make all their system calls via the BDOS. However, very few applications programs rely solely on the BDOS as it's faster and more efficient to use ROS interrupt calls for devices like the keyboard and video. These can be called 'fairly well-behaved' programs. The third group is badly-behaved and makes calls direct to the hardware: for example, direct screen addressing.

PC mode handles all well-behaved programs and also the majority of fairly well-behaved programs that rely on the most commonly used ROS interrupt vectors. In the case of direct hardware calls, problems usually arise if a 'not quite IBM-compatible' machine is used.

DR says that PC mode will run 90-95 per cent of IBM software when running on an IBM machine. In the case of IBM-lookalikes, the figure is around 70 per cent depending on the hardware and what has been done to the ROS. In non-IBM-compatible machines running MS-DOS, DR quotes 30-70 per cent.

When Concurrent is run with PC mode it's perfectly possible to have one virtual console running a PC-DOS program and another console running a standard 16-bit CP/M program.

PC mode can be broken down into two parts: the back end and the front end. The back end automatically tells the difference between CP/M, PC-DOS and MS-DOS disk formats and adjusts itself accordingly. Reformatting isn't necessary here.

The front end is known as the PC-DOS filter and is invoked every time a .COM or an .EXE file is executed: it intercepts PC-DOS calls and tries to do something useful with them. Fig 2 shows that it sits between the applications program and the rest of the system.

Windows

Another feature of Concurrent 3.1 is windows. The world seems to be mad about windows at the moment but frankly I can't see what all the fuss is about.

For those of you who've been in a Tibetan monastery for the last year, windows allow the output of more than one program to be displayed on the screen at the same time. Usually this is done by reserving a different area of the screen for each program so that you can see what's going on in each cell.

Concurrent's version of windows is better than most because each window acts as a port hole to one of the virtual terminals: you can have up to four different programs running in different windows at the same time. This is not true of products such as Microsoft's windows where only the current foreground program is actually running.

The background programs just sit on the screen looking pretty.

Concurrent windows can either be under program control or used interactively with a utility called window manager. Using the manager you can set the colour, expand or contract window size, move windows, and soon. You can also scroll left of right or up and down within a window. One very useful feature is that you can save the contents of a window to a disk file. A particular spreadsheet area can be saved and then incorporated into a document on your word processor. This is useful, because although Concurrent CP/M has structures available for inter-process communication, the applications programs have to be written with this in mind. Saving a window to disk is the only way to communicate data if the applications haven't been designed to talk to each other.

In theory, PC Mode and windows can be run at the same time to allow normal PC applications to be run in a window environment. However, if the application uses direct screen addressing you could end up with some very strange effects!

The ICL machine I used to test Concurrent 3.1 makes use of the multi-user option. This is an interesting addition to Concurrent because DR already has a multi-user operating system in MP/M. It seems likely that Concurrent will replace MP/M as DR's preferred multi-user operating system, and it's not clear where this will leave existing MP/M users.

Let's now look at other features of Concurrent CP/M that are available on single-user machines but are probably more applicable to the multi-user environment.

RE-ENTRANT CODING. With most micro operating systems each user has his own area of memory into which he loads his applications programs. There may come a time when two users are both running the same program in their own user areas. Obviously it would be ideal if both users could share the same code, and this is where shared code comes in.

The problem is that the original program must be written with this in mind: this is known as re-entrant programming. Although Concurrent CP/M has the facilities to support re-entrant programming, few applications have yet been written to take advantage of it. This will change if Concurrent takes off and software houses produce programs for it.

RECORD LOCKING. Record locking is an important part of any multi-user/multi-tasking system. Whenever more than one job is running at the same time it's conceivable that two applications will try to access the same record or file simultaneously. Concurrent CP/M supports both record and file locking.

So much for Concurrent 3.1's general applications. What does it look like when in use? In general terms, Concurrent is very like CP/M Plus which in turn is quite like good old CP/M 2.2. Anyone who has worked with CP/M will soon see that a great many favourite utilities have been dusted off, updated and included in this package.

The first thing you notice when the machine is switched on is the status line at the bottom of the display. This usually says something like 'CONSOLE=0 DYNAMIC WS A PRINTER=0'. You always know it's CP/M when you can't understand the messages!

CONSOLE=0: you are currently using virtual console 0. If you move to console 1 the indicator changes to tell you this.

DYNAMIC: each virtual console can be either in Dynamic or Buffered mode.

If the console is in Dynamic mode and is switched into the background any output that would have gone to the screen is written to a special area in RAM. If the memory fills up, old data is lost and new data is written in: important data can therefore be easily lost.

If the console is in Buffered mode and switched into the background then screen data is written out to a temporary disk file. If the temporary file becomes full, the program is suspended until the console is switched back into the foreground. The data is then retrieved from the disk and written to the screen.

The console mode is set by using the VCMODE utility which also sets the maximum file size for buffered files.

WS: indicates the name of the program or utility currently in use.

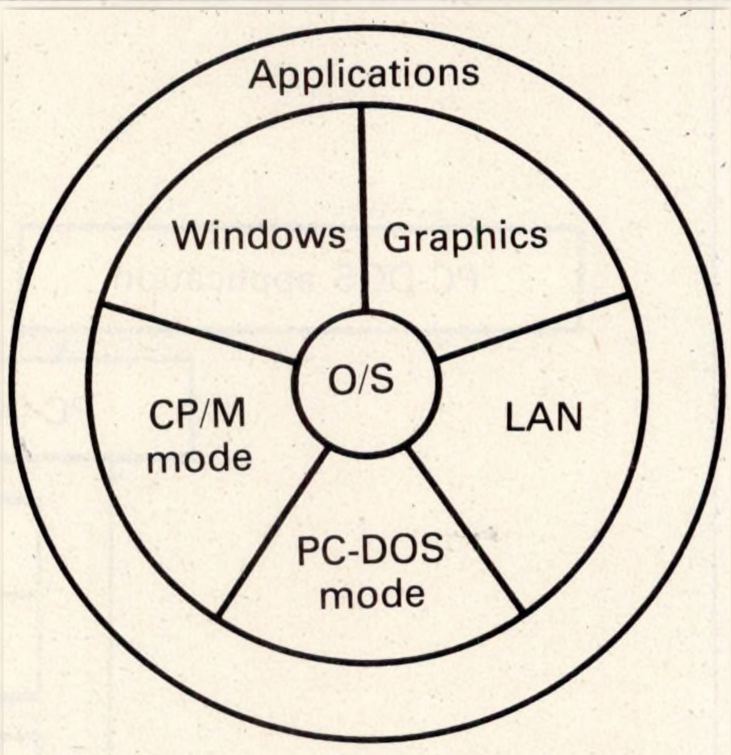
PRINTER=0: some micros support more than one printer. In this case, a different printer can be assigned to each console using the PRINTER command. An interesting omission from Concurrent 3.1 is a print spooler. Only one process at a time can use a given printer so other processes must wait. This is not too much trouble with a single-user machine but is a problem on multi-user machines.

Unusual utilities

In addition to the usual CP/M utilities (PIP *et al*), Concurrent has its own specialised utilities. I have already looked at VCMODE and PRINTER: the other main ones are ABORT, CHSET and SET.

ABORT: allows programs that are running in the background to be stopped. A good example is debugging a wild program that refuses to let itself be stopped: move into another screen and type ABORT WILDPROG.

CHSET: allows parameters to be set in the header record of a command file. These parameters are: SHARED on or off, 8087 on, off or optional and SUSPEND on or off. The SHARED parameter sets the option for the program to support shared (re-entrant) code or not.



Overview of Concurrent 3.1 system

The 8087 parameter allows CMD programs to make use of the Intel 8087 maths co-processor if it's included on your hardware. If the 8087 is specified as optional the program will use the chip if present, but if not the program will emulate it. The SUSPEND option specifies whether or not the program will stop if it's switched to background mode.

SET: CP/M Plus users will be used to SET. Its main use is to change such things as file or disk attributes, passwords, protection.

Conclusions

I've been waiting a long time for DR's response to the success of PC-DOS and MS-DOS. Now we have the answer: 'If you can't beat 'em, join 'em.'

If DR wants to stay in the 16-bit software race it has to get its system into the IBM market and onto PCs in large volumes. PC mode is obviously the tool it intends to use to do this and it works well enough; but PC mode on its own will not convince PC owners to change operating systems. The main pull will come from the Concurrent processing ability.

When I first heard about Concurrent I thought it a good idea but of no immediate use to me. I was wrong. It's only when you use Concurrent that you see how useful it can be. The ability to switch between screens at will means that different applications can be loaded up and the user can switch between them at will.

If there is any justice, IBM owners wil be queueing up for their copies of Concurrent 3.1. It's certainly the most useful of all the major single-user micro operating systems available today. Microsoft has made a big mistake in allowing itself to be sidetracked by mice, ikons, *et al* and not bringing out a Concurrent operating system of its own. END

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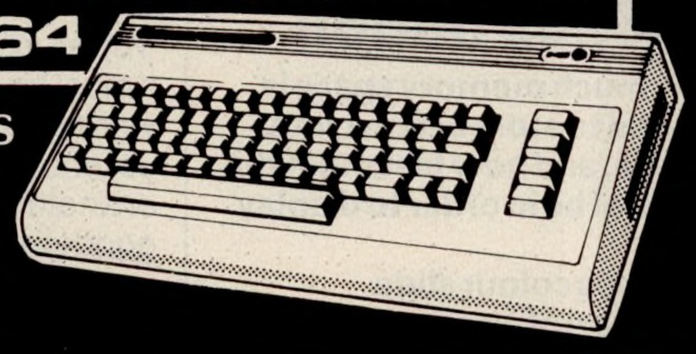

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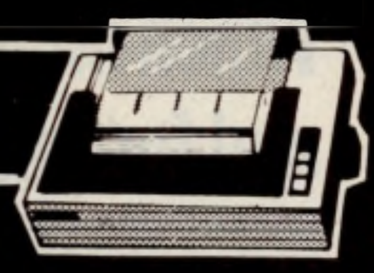

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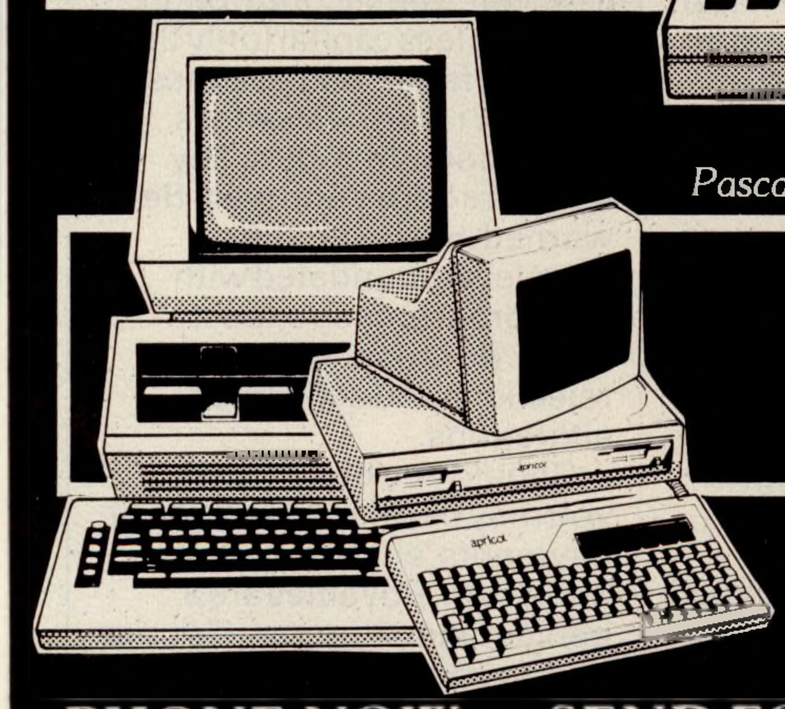

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COMPUTER ANSWERS

Send your queries to Tony Hetherington, PCW, 62 Oxford Street, London W1. Note that Tony cannot answer questions on an individual basis, so please don't send an SAE with your query.

Safe software design

A friend and I are designing software aimed at the private investor. If successful, we want to offer the programs on cassette and disk.

How do we obtain good duplicates from our originals while keeping our design safe? Should we copyright the program?
SJ Ashton, Slough

Tape and disk copying companies frequently advertise their services (see *PCW*'s Micromart section).

To protect your design, it's advisable to display a copyright notice on the title sequence of your program. This takes the form: C inside a circle, name of the copyright owner and year of publication. You can further protect the work by inserting hidden copyright notices in the coding, and by providing extensive documentation to deter pirates.

To provide evidence of when the work was created, post a copy to yourself by registered mail. It's also possible to register your work with the Society of Software Authors, affiliated to the Computer Trade Association, which keeps a software register.
Margaret Spooner

Which modem, and for what?

I own a Commodore 64 with a printer and disk drives and am now thinking of buying a modem. I would be grateful for the following information:
1 What types of modem are readily available and at what prices?
2 What type is most useful for home use?
3 Where can one obtain software?
4 What information is obtained using a modem?
Please advise me.
Vincent Julier, Camberley, Surrey

There is a large variety of modems falling into two categories—hard-wired and acoustic. Hard-wired modems plug directly into the computer's serial port at one end and the telephone socket at the other. Acoustic couplers do not have a direct connection between the computer and the telephone line, but convert an audio tone into an electrical signal. Acoustic couplers are available from £160, while hard-wired modems can be bought for £50-60.

There are three main uses:
(a) Access to commercial database systems like Prestel.
(b) Access to free public access systems (bulletin boards).
(c) Direct user-to-user transfer of software and/or text and data files.

Prestel operates at 1200/75-baud (for an explanation of baud rates, see 'Newcomers start here'). This means that it transmits at 1200-baud but receives at 75.

Prestel is a large database containing news, software, competitions, timetables and information supplied by companies. The main area of interest for computer hobbyists is Micronet 800, the primary feature of which is free software. Among the free software available is a selection of *PCW* Programs.

There are also a number of boards run by companies such as Maplin. These boards are primarily intended to allow customers to place orders, check stock levels, and so on, though some messaging facilities are also offered.

Most public bulletin boards operate at 300-baud, data being transmitted and received at the same baud rate. Bulletin boards generally offer free software, but their main purpose is to enable users to leave and reply to messages. These messages range from jokes, through sales-and-wants to requests for technical info. Most boards provide confidential electronic mail facilities for private correspondence between individual users. Bulletin boards are generally oriented towards computer hobbyists. Commercial systems like Prestel are geared towards naïve users.

Modems can also be used by individual hobbyists to exchange files or programs over a distance. Modem transfer is often more convenient and reliable than sending cassettes through the post.

For Prestel and most other commercial boards, you will need a 1200/75-baud modem. The Micronet 800 modems cost around £100. It's also possible to access Prestel using a 300-baud modem on (01) 248 5747, though this is expensive if you live outside London.

For bulletin boards, you will need a 300/300-baud modem which can also be used for private user-to-user transfer, but a 1200/1200 will be healthier for your phone bill as it transfers information at four times the speed! A modem which incorporates all these standards—and more—is the Minor Miracles World Standard 2000, reviewed in this issue.

PCW will be dealing with communications software in future issues. In the meantime, you'll find plenty of information about networks and communications in our Network News section.
Surya

Science fiction

How much memory space is needed to store a television picture, and how fast must the retrieval be in order to display it?

I have a colour slide collection of about 1500 pictures, collected over the last 30 years, and I wondered whether they could be stored on a winchester. My simple calculation is 625 x 625 pixels x 3 colours x 6 intensities = 7Mb per picture. Read out speed at 25 frames per second is ·04 seconds divided by 7Mb equals 5·7 nanoseconds per bit.

Is this correct?
RA Holt, Bournemouth

I'm afraid that your question, let alone the answer, is still in the realms of science fiction. Although in the current age of computer innovation fiction and fact are almost indistinguishable, technology lags behind in this case.

Your 'simple' calculation highlights the basic requirements of a system for storage and retrieval of colour television pictures. Such a system does not exist.

There are rumours that the forthcoming MSX Sanyo machine has the ability to grab and store monochrome TV pictures, but no actual information is available. Even so, this is short of your requirements. Your best hope is the research into the use of laser discs as computer storage devices.

All your micro can do is hold an index for your collection.
Tony Hetherington

Programs for profit

Could you please advise me on the basic facts of writing games programs for profit, or recommend an article or book.

What is the best computer for such an activity, who will buy the games once written and how much will they pay?
A Jones, Cardiff

There aren't many books or articles available on writing games for profit (probably because the people who know are far too busy writing games), but here are a few points to bear in mind.

You must have a game to sell and it must be worth selling. In other words, the market will not stand yet another synonym of Pac-Man or another Space Invaders. A good test is to look honestly at your own game and ask yourself whether you would be happy with it if you'd just spent your hard-earned cash on it.

Once the game is written you have two options: either sell it yourself or let someone else do it for you. The second option requires less capital (only the cost of a few blank cassettes) but your return will be less.

Then, send a copy to any software house and wait. Be warned, however: these people are inundated with such programs so expect a delay. Be prepared for many rejections and suggested alterations.

Should you be successful, you may be offered a choice of payments, either royalty or lump sum. Royalties are a percentage of the game's price paid to you as the game is sold.

An alternative is the single payment of a lump sum which buys all your rights to the game. Royalties are preferable, as a lump sum may be well below the value of a good game. As for the machine, any of the top sellers will support a good game.
Tony Hetherington

The elusive Elan

I have now saved enough money for a microcomputer, and after reading your article on the Elan (November 1983 issue) I would like to purchase one.

Unfortunately, my local computer shops can't help me.

I believe it comes out in April, but will I be able to purchase one then? Will my local shops be selling it? Could I order one direct from the company?
Matthew Downton, Andover, Hants

Due to various legal wrangles, the Elan company changed its name to Enterprise. For this reason, the launch of the computer (also called Enterprise) has been delayed until September. Although a name change seems a minor problem, it means that the documentation and promotional material must also be changed. This takes time, hence the delay.

According to Enterprise, when launched, the machine will be available through High Street shops. The 64k model will be released first at a cost of £199 + VAT, followed by the 128k model and the peripherals which will be out 'in time for Christmas'.

The Enterprise will arrive in the shops exactly one year after its debut at the *PCW* Show. Only then will we be able to judge whether it can compete with the Amstrads and QL's, or if it will be dismissed as last year's machine.
Tony Hetherington

Commodore syntax error

I recently bought a disk drive for use with my Commodore 64, mainly as a word processor but also to write my own programs. When I try to run a program it fails and displays the curious error message 'SYNTAX ERROR in 0'.

This is particularly confusing as my programs do not contain a line 0. Please help, as this is seriously hindering a would-be programmer.
P Darby, Middlesex

You have typed in your program *after* listing the disk's directory. Consequently, the directory is still in memory and is saved with the program when it's saved to disk. When you try to run the program, it produces the error message as it tries to interrupt the directory display. The error is in line 0, as the first line of the directory display is line 0 and contains the disk name and ID. The other directory display lines will also be fixed in your program with the line number being the blocks used by that file or program: that is, a program stored in four blocks will be included as line four.

The easiest way to avoid this is to type NEW before writing a program to clear the computer's memory. To remove extraneous directory display lines from existing programs, enter their 'line' numbers (for example, 0).
Tony Hetherington

NewBrain queries

Two queries arise from your 'In Focus' article on the NewBrain (March '84 issue):
1 What is the address of the Cambridge NewBrain User Group?
2 Gerald McMullon's review states that fully-commented ROM source listings have been available for several months. From whom are these obtainable?

Also, can you explain the format of the NewBrain's 6-byte floating point numbers? The (expensive) Technical Manual is coy about this.
BJ Lilley, Great Yarmouth

The address of the Cambridge NewBrain User Group is 36 Armitage Way, Cambridge.

Fully-commented ROM source listings are available from Tradecom at a cost of £700 per ROM! However, people wishing to use them for the purpose of writing a book on the machine should be able to obtain them free of charge, providing they have a commissioning letter or similar reference. Tradecom (UK)'s address is Glebe House, Arnfield Close, West Wolsey Trading Estate, West Molsey, Surrey.

The format of NewBrain 16-byte floating point numbers is as follows: the lowest byte contains the exponent, the following five contain the mantissa with the most significant bit first. Of the exponent, the top two bits are reserved for the signs of the exponent and the mantissa, in that order. For example: pi is stored as 2,3,36,63,106,137; 1 is stored as 2,1,0,0,0,0; 1/2 is stored as 0,128,0,0,0,0.

You don't need to know all this to access or use these numbers. Conversion from decimal to binary and back is automatic, and Z-calls to the maths pack can be used to access any numbers.
Gerald McMullon & Jerry Sanders

Commodore address package

I am secretary of a local club and therefore regularly send letters to members announcing events. Is there a suitable software package available for this purpose? As my son has a Commodore 64, it would be useful if the package could be used with this machine.
E Willis, Swansea

The package you require is the MailMerge facility included in the Easy Script word processor, currently being offered free with the Commodore disk drive.

It merges an address file with a letter, using the word processor to produce a letter correctly addressed to each member.
Tony Hetherington

Disk drives explained

I am completely perplexed by the descriptions given to disk drives. I understand their basic operation as a storage medium, but could you explain in more detail than your Newcomers page the exact operation of disk drives and the meaning of terms like density, sectoring and the number of tracks. How important is each of these in the operational use and cost of drives and disks?
Bob Wade, Orpington, Kent

A disk is a circular piece of plastic coated with a magnetic surface. When it's placed into a disk drive, a motor rotates the disk while the read/write head moves across it.

Before a disk can be used, it must be formatted. Formatting involves magnetically dividing the disk into concentric circles known as tracks, and radiating divisions known as sectors. The areas bounded by tracks and sectors are known as blocks. To find a particular item on the disk, the operating system 'looks up' the block containing the file in its directory. It then moves the read/write head to the appropriate track and waits for the required block to pass the head as the disk revolves.

Density refers to the amount of information which can be stored on a disk: that is, how dense the tracks and sectors are. The terms single-density, double-density and quad-density do not refer to specific capacities, as this varies from one disk drive to another. Most disks are either 35-, 40- or 80-track.

In theory, the more tracks and sectors a disk has, the greater its capacity. But because different disk drives organise their disks in different ways, this is not always true. Typical disk capacities vary from 100k (100,000 bytes, or characters) to around 800k.

Disk drives may also be single- or dual-sided. Dual-sided disks use both surfaces, so can store twice as much data as an equivalent single-sided disk.

Disks are often sold as 'single-sided, double-density', and so on. This is merely an indication of the quality of the disk. All disks are manufactured in the same way. They are then tested as double-sided, double-density. If a disk fails the test, it's tested as single-sided, double-density. If it fails this test, it's tested yet again, and is rejected altogether if it fails the final test.
Surya

Ideal small business machine

I want to put my business files onto a small computer. Which, in your opinion, is the better machine: the Sinclair QL, the BBC Micro or the Memotech MTX?

Can the QL cope with over 900 files?
M Campbell, London SW15

You haven't provided enough information on the machine's proposed uses. The fact that you quote 900 files doesn't help because I don't know how long each file is.

There is a large number of sub-£1000 computers with twin disk drives that may be of use to you. In addition to those you mentioned, you could look at the Sanyo MCP555 and the recently relaunched Computers Lynx business machine.

I can't comment fairly on the QL because, at the time of writing, no-one has seen a production model that works properly.

The BBC is good but you'll have to add disks: you could use either normal BBC drives or the Torch disk pack, which turns the computer into a CP/M machine. The MTX also looks promising.
Peter Bright END

Sharp PC5000

Many major companies in the computer industry have competed to produce the definitive portable micro: practical and compact but with all the specifications of a desktop machine. Sharp, an innovator in the field in 1980 with the PC-1211 calculator, now presents the PC-5000, a powerful, battery-powered portable computer that combines complete functionality with many impressive features. Dick Pountain puts it through its paces.



Sharp has as strong a claim as anyone in this business to have been the pioneer of portable computing; the PC-1211 was the first pocket-sized 'calculator' to run the Basic as its operating language, and it pre-dated the current crop of lap-sized portables by three years. Since that first, Sharp has followed up with the more functional PC-1500 (with its novel miniature colour plotter) but the impetus in the portable business has transferred to the likes of Epson, Tandy and NEC with lap-held machines which feature full-sized typewriter keyboards and thus support word processing on the move.

Now, Sharp enters the fray once more with a bang. It has leap-frogged over the competition by launching a battery-powered, 8088-based MS-DOS computer which is little larger than a modern portable typewriter and yet contrives to include a printer and display. It also uses state-of-the-art bubble memory cartridges for mass storage, a feature it shares only with the likes of Gavilan and Grid, machines costing three times the price of the PC-5000.

Hardware

The PC-5000 is packaged in a smart beige ABS case, which at first sight gives no hint that it contains a computer but rather resembles a portable typewriter. The illusion is dispelled by undoing two slide-catches at the front sides of the case, whereupon the forward half can be swung upwards revealing the keyboard while the underside of this lid contains the LCD display. Curiously, there is no carrying handle so transporting the machine is very inconvenient; it is just too heavy to sit under your arm like a Tandy.

The keyboard is a gem; its sculptured keys having the perfect combination of feel and click; they are well made with properly inlaid rather than stencilled legends. Layout is good, with large SHIFT keys, a huge RETURN key and all the control keys (CTRL, TAB, ESC, CAPS, ALT and DEL) sensibly sited and picked out in a dark brown colour. Two-key rollover and type-ahead allow full typing speeds to be maintained.

Above the keyboard is a row of 15 function keys. Eight of these are programmable function keys, used extensively by the tailored software; the rest include four cursor control keys, clear screen/insert, and two picked out in orange called ON and OFF. These are not, as one might expect, used to switch the computer on and off (this is performed by a standard rocker switch at the back of the case), but to put it to sleep. Power conservation is crucial on a battery machine and so whenever it's not in actual use you are recommended to hit OFF which puts it into a low consumption state with no display, to be revived when required with ON. However, this feature needs to be explicitly supported by the software and will not operate with just any old program. For instance, the Communications package supports its use, so that the machine can wait for incoming modem traffic without running down the batteries; the word processor irritatingly doesn't.

Above the keyboard, on the front edge of the case is a small trap-door which conceals the single bubble memory cartridge slot. The actual media are small metal boxes (2in × 3in × ¼in) which fit onto an edge connector and are locked in place by a lever which also serves to eject them for removal. The boxes are in beautiful blue anodised aluminium and look as expensive as they are: they cost £169 each! Each cartridge stores 256k, which compares very favourably with the size of floppy disks commonly fitted to portable machines. The manual refers to the capacity as 128k, so one must assume that these are a more recent upgrade containing two bubble chips instead of one. They are treated by MS-DOS as if they were floppy drives. Next to the trap-door are three small coloured LEDs, indicating low battery, power on, and bubble in action. The green light flashing as a bubble loads shows that the data rate is like that of a rather slow floppy disk drive.

The top of the case on the test machine was occupied by a removable hinged panel covering the optional thermal printer. This is a miniaturised thermal transfer dot matrix printer which uses a cartridge ribbon and typewriter-style friction feed. There are no moving pins in the print head; instead, heating elements cause carbon to be transferred from the special ribbon. Dot graphics can be printed from Basic, and there are two pitches for text, 12 or 10 char/inch (80 or 66 char/line).

The typeface is elegant and spindly with serifs, quite unlike normal dot matrix print. Packets of single A4 sheets of two kinds of paper, *viz* thermal transfer and heat sensitive were supplied. The former requires the use of a ribbon cartridge, whereas the latter works without a ribbon by heat alone. In addition, the ribbon will work after a fashion with ordinary paper, though the transfer of carbon is not so



Compact dual 5¼in disk drive unit

good because of the rougher surface. Thermal transfer paper with the ribbon gave slightly better results than heat sensitive without, but both were better than cheap dot matrix impact printing.

I fed in ordinary typing paper and got a rather scruffy but legible impression, which might be useful if you were to run out of supplies in the Sahara Desert. The biggest drawback of the printer is its low (30cps) speed which makes the printing of a long document compare unfavourably with watching paint dry as a recreation. A bonus point though for quietness; it's almost silent in operation.

Behind the printer is a slim compartment containing the battery. Sharp has broken new ground by using a miniature lead cell (like a car battery) in place of the now common NiCad. This tiny unit (the size of a Mars Bar) holds charge for six hours continuous use and gives two years' service. The machine can be used with a mains adaptor which simultaneously charges the battery, taking 48 hours to achieve full charge. Alternatively, setting a switch on the back to CHG allows 'crash' charging in eight hours but the machine can't be used (suitable for overnight charging). Given these parameters it's clear that a certain amount of power discipline will be needed from



The well-designed keyboard is a pleasure to use and contains 15 function keys

the PC-5000 owner, and also that this machine can survive train and plane journeys but not prolonged use in the jungle or desert without special charging provisions.

The back panel of the machine is a busy area. At the far left are the power on and charge switches. Next to these is a Sharp proprietary serial port for use with a modem and other future peripherals. Moving along, we have a standard 27-pin D type RS232 connector followed by a parallel bus expansion socket for connecting disk drives and then standard EAR/MIC/REM mini-jack sockets for a cassette recorder. At the far right hand end is the AC mains adaptor socket.

Underneath the case are two compartments with screw fasteners which hold memory expansion modules. The PC-5000 comes with 128k of RAM fitted and two 64k expansion modules can be added to boost this to 256k. Alternatively, one of the slots may be used for the 64k ROM Basic interpreter; small slide switches inside the compartment allow the memory map to be configured to suit the different options.

Between the expansion compartments is a small slide switch (fortunately well recessed) which disables the system master clock for long-term storage. The clock calendar has its own NiCad cell which is automatically recharged from the mains batteries in normal use.

The eight line by 80 column LCD display is fitted into the swivelling lid which covers the keyboard. The display can be set at different viewing angles by turning this lid to the appropriate position where it locks on a ratchet. This ratchet has a flimsy feel though and I found it generally wiser to swivel the display back to its full extent where it rests on the case and feels much more secure. A knurled thumbwheel hidden down at the right side of the case allows the contrast to be adjusted (a similar one next to it controls sound volume), but the contrast of this unit is inadequate. The Epson and Tandy lap-helds are used in a horizontal position and so receive direct illumination from the room lights and oblique daylight from windows. The PC-5000 display is used either vertically or at most tilted 45° backwards, and in neither position does it receive enough light unless you can arrange to sit with your back to a bright window or shine a lamp straight onto it. In addition, the clear plastic screen is highly reflective so the latter course creates as many problems as it solves. There is no way that this display can be read comfortably in anything less than outdoor daylight or a very well lit room. There appears to be no provision for TV or monitor output, though it could possibly be fudged through the serial port by performing brain surgery on the BIOS.

The display is also quite slow to update which, when combined with the not excessively rapid bubble, makes for a rather sluggish response to, say, a directory request.

The typeface is attractive, with true descenders, and comes in two weights: 'light', which is one dot thick, and 'bold' which is two dots thick. The use of light at the MS-DOS command level exacerbates the contrast problem; inside the word processor bold is used for text, and it's much more legible.

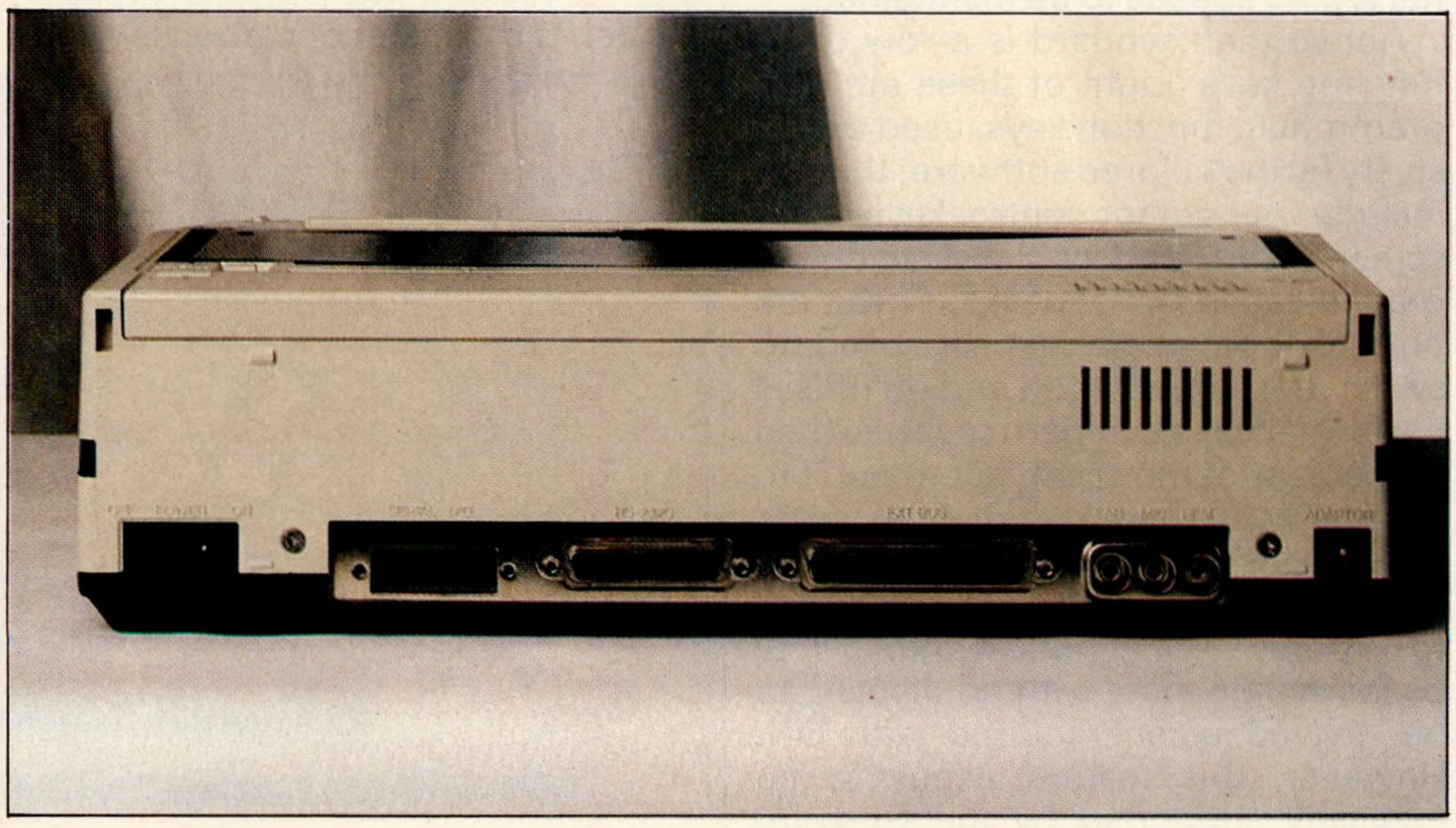
I can't tell you a great deal about the machine's insides because for the first time in my career I chickened out from taking a machine to pieces. Having removed the top case it became apparent that dismantling the rest was going to be a lengthy task and reassembling it possibly a non-terminating one. A typical small miracle of Japanese production engineering, it wastes not a cubic millimetre of internal space and gets the equivalent of most of an IBM PC in there. The main board is in the bottom of the case facing downwards so I can tell you nothing about the chips, but the PCB is a work of art with tracks little thicker than a spider's web in places. Sharp's specification sheet says that there is a second (8-bit) processor in addition to the 8088, and one could guess that this might handle the decoding of the bubble memory.

Untangling the memory map is no joke. According to the manual the PC-5000 contains 192k of ROM (64k 'System Program', 64k MS-DOS and 64k Basic!) which I find scarcely credible. The ROM-based MS-DOS is not a full version 2.0: the full version with all the transient commands is supplied on disk as an extra. Even more puzzling is that both the ROM-DOS and Basic require a bubble to be inserted before they can be used, which apparently must have MS-DOS.SYS and IO.SYS on it (another 35k of code). So what's in that 128k of ROM? Macintosh gets its whole windowing operating system into half that space! Maybe it's the code that blows the bubbles . . .

If you try to boot the system without a bubble, an error message says 'Press CR to start Basic without DOS.' Doing so reaps a fresh error, 'Invalid Basic version. Please load DOS . . .' This, the manual politely explains, is a left-over from a previous version of the computer which had a non-DOS Basic; it would have been more polite still to remove such confusing nonsense.

In most respects the PC-5000 behaves very like any desktop MS-DOS computer. I was supplied with a dual 5¼in disk drive unit: this is not the old Sharp MZ-80FD but a much more compact unit using twin half-height drives, each with a formatted capacity of 360k. These worked well but made an alarming noise like a miniature chainsaw when in operation.

When using the bubble memory one is aware of some differences from an ordinary floppy system not the least of which is its complete silence. The bubble cartridges come from the factory pre-formatted and the DOS FORMAT command will give an error message if you try to use it on one. All the other DOS utilities work as normal though, including DISKCOPY and COPY (though you cannot DISKCOPY a disk to a bubble or *vice versa*). Bubble cartridges can be write-protected just like disks, by putting a silver sticker over a black patch on the side. The most unsettling difference is that the bubble 'drive' is regarded by DOS as being both devices A: and B:. This is not like a partitioned winchester though: drive A: is the default drive upon cold start and holds a single bubble cartridge. If you now log on to B: you will be prompted to insert a new cartridge into the slot, which the system then calls B:. This is done to allow backing-up of cartridges using only the single drive. If the same cartridge is left in place DOS will not complain, so you'd better keep



View from the rear.

a clear head if you're copying a lot of files by this method. The floppy drives are devices C: and D: and the system always boots from C:, if present, on power-up.

The version of DOS supplied is 2.00 with all its Unix style features such as hierarchical directories, pipes and filters. The MORE filter is especially appreciated with an eight line screen so I created a batch file called FILES.BAT to do a paged, sorted directory (containing DIR || SORT || MORE). As pipelines require writing to the bubble this took *28 seconds* to produce the first page of files, which was rather depressing. The MODE command performs some hardware specific tricks such as setting the display to 40 or 80 columns, initialising the internal printer for 80 or 66 characters and different line spacings, and setting up the parameters for the two serial ports.

By choosing to implement a standard disk operating system like MS-DOS, Sharp has lost some of the unique advantages of a portable computer. Although I assume that the RAM is all CMOS for reasons of power consumption, it's not possible to store files in non-volatile memory; everything must be saved to bubble as, even if the RAM does preserve its contents, MS-DOS will clear the TPA on boot-up. A simpler operating system that used RAM files and merely saved a memory image to the bubble might have been more useful.

Software

The software Sharp is offering with the PC-5000 is all US produced, from Microsoft and Sorcim, but packaged with the Sharp logo. Microsoft has provided the DOS and a version of GW-Basic which is very close to that on the IBM-PC, even down to the bit-mapped graphics routines. Sorcim has written the main applications suite, called the SuperTools. This is a set of four programs which are integrated via a menu-driven, front-end program which makes use of the function keys, and can exchange data via a common memory area called the Scratch Pad.

The four applications are: SuperWriter, a word processor; SuperCalc 2, the well-known spreadsheet; SuperPlanner, a diary and schedule program; and SuperComm, a communications program for transferring data between computers and logging on to bulletin boards and remote databases. At the time of this review I was only supplied with Superwriter and SuperComm.

The Master Menu, seen when the SuperTools are first booted, assigns the different programs to the programmable function keys with a set of onscreen labels. This is not wholly effective as the display is almost a foot away from the function keys and the eye cannot relate label to key; Sharp supplies blank card templates to label the function keys but these can only cope with one or two menu levels. Each application makes its own use of function keys and so menu nesting may go down to three or four levels. Function key F1 is reserved in all places as a Help key, and it produces help screens relevant to the latest operation performed.

In addition to the four application programs (actually five as the Planner is used again as a memo pad called Reminders), there are menu options to perform all the DOS housekeeping utilities, set the time and date, and to program an Alarm which prints a reminder message as well as beeping at the set time. A permanent display of the time and date is maintained on the Master Menu screen and also in the introductory screen of each application. The Master Menu can be reconfigured by the user by editing a file called SUPER.FIG, so that new applications can be added or deleted and the Help screens can be modified.

SuperWriter is a very usable word processing program with all the features one would expect on a professional system. It is controlled by a mixture of menu choices and direct commands; all cursor movement in the document is by WordStar-style control sequences, but more complex operations like search-and-replace and block moves are done from a menu of function keys. This gives a good compromise between ease for beginners and speed for experienced users. All the control codes are explained in a series of Help screens. The introductory screen invites entry of author and operator names and comments, in Wangwriter-style, and a history of each document can be maintained on disk. One very neat feature is the provision of a variable called %DATE which can be inserted in a document and is replaced automatically by the system date at print time. The option of creating automatic backup files is offered in the SAVE menu.

The principal limitation of SuperWriter is that it doesn't use virtual memory techniques, so the largest document that can be edited at one time is governed by what will fit into RAM. However, files can be chained for printing using the insert command and long documents can be edited in chapters or other smaller units. There are no mail-merge or spelling-check facilities.

SuperComm is a menu-driven asynchronous communications program which can drive either of the PC-5000's two serial ports. Since Sharp's own 10-key modem is only likely to be sold in the US, the RS232 option is of more relevance to UK users. The program can be used at baud rates from 100 to 9600 with all the permutations of stop bits and parity, but the only protocols recognised are XON/XOFF or none. SuperComm can buffer up to 7500 characters in its session log, and the log can be inspected by scrolling either way with the cursor keys and saving to disk or bubble. Rather than merely using the PC-5000 as a dumb terminal, files can be created using any of the other tools and transferring to another remote computer. A trace facility allows a sequence of commands to be stored as an executable file, useful for automating the long complex log-on sequences required by some networks.

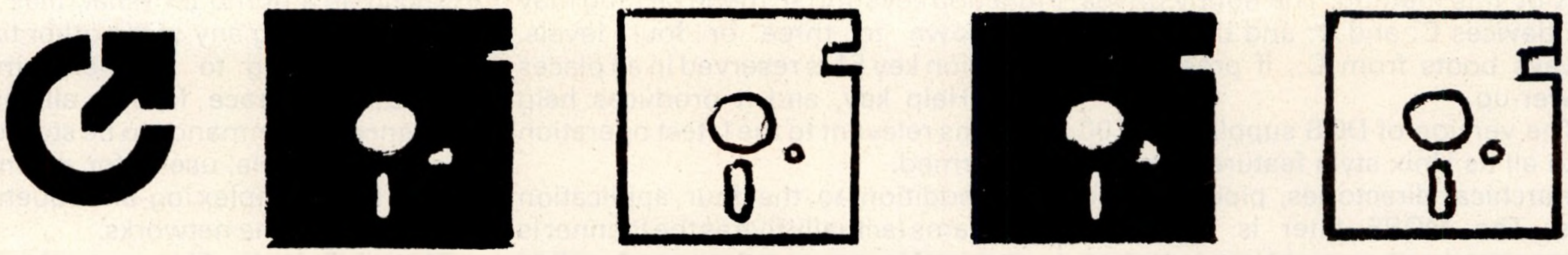
These Execute files can also be scheduled to run themselves, unattended, at a time set by the system clock. To use this facility it's necessary to have an auto-dial/auto-answer modem (not yet such common fodder in this country as the US). The idea of my computer phoning me up at a dinner party to tell me that it's time to take the pills is pretty spooky anyway.

The Basic provided with the PC-5000 is, as mentioned above, very close to that used on the IBM PC, though rather slower according to the Benchmarks. Data types supported are integer (16-bit signed), single and double reals (6- and 16-digit) and strings, and variables can be assigned these types explicitly with DEF statements or symbolic suffixes %,!,£ and $. Decimal, hex and octal notation are all allowed for numbers.

Communications are directly supported in the Basic by means of the COM ON, COM OFF and ON COM GOTO/GOSUB statements which allow a Basic program to monitor the communications line and branch on the receipt of a call. By using COM STOP this monitoring can be postponed (that is, put into the background) so that important parts of a Basic program can execute undisturbed. When the next COM ON statement is reached, any communication received while COM STOP was in force will be remembered and may be acted on by ON COM GOSUB to a suitable handling routine. The size of the communications buffer can be reserved when Basic is first loaded by calling it with the /C option, for example, BASIC/C:1000 reserves 1000 bytes.

Graphics are supported through Microsoft's Graphic Macro Language, in which objects are described by strings of single character instructions (U for Up, D for Down, L for Left, and so on). These strings are then used as parameters in the DRAW statement. CIRCLE will draw any ellipse, not merely circles, and LINE draws either between chosen end points or relative to last point plotted. Areas can be filled with the PAINT statement; there is even a COLOR which can only be black or white on the 5000 but it can also alter the weight of text. Sound is also well catered for with BEEP, SOUND and PLAY. The latter takes strings of characters in a 'tune definition language' analogous to that for DRAW and plays them as tunes. SOUND is programmable for frequency and duration but only a single voice is provided.

Both random access and sequential files are supported on the disks and bubbles, and sequential files on



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cassette tape.

The only concessions to structured programming are the now standard WHILE . . . WEND and IF . . . THEN . . . ELSE. The full screen editor is exactly as that on the IBM PC and is the best of its kind, allowing total freedom to edit anything at the cursor position: ^F and ^B cause the cursor to skip along by whole words only. It's the only Basic screen editor I've used that handles long lines that wrap around in an intelligent fashion. Single stroke entry of keywords is possible using the ALT key with letters, and the function keys are programmed with direct mode commands like RUN and SAVE.

In principle, there is no reason why a variety of other programming languages shouldn't be run on the PC-5000, assuming one can get copies on the Sharp disk format. Pascal, Fortran, Forth, C, Cobol and various other compilers can now be obtained for DOS 2.0, and the PC-5000 has the memory to run any of them.

Documentation

I was supplied with three manuals: the PC-5000 User Guide, the Professional Series Software manual (covering the SuperTools) and a standard MS-DOS manual including the Macro-86 assembler.

The User Guide consists of a section on assembling the PC-5000 (including installation of the printer), a survey of DOS commands, and the Basic manual which occupies most of the book. The setting up section is clearly written and illustrated with diagrams, and it takes the first-time user in a reassuring manner up to the point of booting MS-DOS; whether the user has any idea what MS-DOS *is* or what to *do* with it, is another matter. Equally, an experienced user or programmer will find no technical information of any depth save for a half page specification chart of the sort more appropriate to a pocket calculator, and it is to be hoped that a technical manual exists for the use of software houses who intend to produce for the machine. In short, the manual falls very far short of the sort of documentation produced by IBM or Apple, or even Sharp's own documentation for earlier machines, which though written in *pidgin* was very comprehensive.

Sorcim's SuperTools manuals are readable, informative and well presented, with proper indexes and large glossaries of terms so there should be no difficulty in using these programs. The MS-DOS manual is the standard Microsoft document with a few changes where appropriate to refer to the differences between bubble and disk; it is comprehensive concerning the DOS but again does not contain the low level information about the PC-5000 implementation that programmers will need.

In perspective

Who could use the PC-5000? Bear in mind that apart from the size of the screen this computer is equivalent to an IBM PC, so in principle it should suit the same users with the added bonus of extreme portability. In practice, the small (and very slow) display makes the regular use of large spreadsheets something of a torture. The battery life is not long enough to recommend it for use in the outback, though it's plenty for a day away from the office. So the ideal user would seem to be a business person who does a lot of travelling and needs to take word processing, calculation and communications power along while the disk drives sit at home or in the office for archival storage of data. Alternatively, one can forego the disk drives altogether as long as there is another MS-DOS machine at the office with an RS232 port; the PC-5000 will then down and upload data from the mother machine when required.

The machine is very much more portable than an Osborne or Kaypro, and given the built-in printer, more fully functional than the £5000 Grid Compass at less than a third of the price.

It seems a pity that there is no provision for a full-sized monitor, since this would make the machine absolutely equivalent to its desktop rivals when at its home base.

What are the prospects for software supply? The choice of a 'standard' like MS-DOS is a good idea in principle, and there should be some third party software available more or less immediately. Don't, however, assume that all the IBM PC software will automatically become usable. The bulk of well known US software for the PC is 'badly-behaved'; that is, it either talks directly to the hardware, bypassing PC-DOS, or at best it directly calls the IBM ROM BIOS which is copyrighted. Programs such as Lotus 1-2-3 need to be extensively rewritten to run on so-called 'compatible' MS-DOS machines.

Prices

	£
PC-5000 (includes Basic ROM)	1195
CE-510P printer	275
Twin disk drive	675
Bubble cartridge (blank)	169
64k expansion RAM	95
SuperTools software	
On bubble	345
On disk	90
MS-DOS disk	55

Conclusions

The PC-5000 is a very powerful portable computer. It's the only machine around that combines a 16-bit processor, built-in mass storage and printer with briefcase portability. It is also good value for money considering that it offers nearly all the functionality of a desktop MS-DOS computer. Its only serious competitors are the American 'executive' portables such as Gavilan and Grid, which cost much more.

Its weaknesses lie in the quality of the display, which seems to be stretching the capabilities of LCD almost to the verge of impracticality, and the high cost of bubble memory media. This last problem is likely to remain until they are in widespread use and very high volume manufacture. END

Benchmarks

BM1	2
BM2	6
BM3	16
BM4	17
BM5	19
BM6	33
BM7	55
BM8	52

All timings in seconds. For a listing of the Benchmark programs see 'Direct Access'.

Technical specifications

CPU	8088
Memory	RAM 128k Expandable to 256k or 192k with Basic ROM. ROM 128k + 64k Basic
Display	80×8 chars text, 640×80 dots graphics
Other I/O	Sound generator
Clock	Powered by own NiCad cell
Power source	Internal rechargeable battery or 250v AC with supplied adaptor
Ports	Sharp serial port RS232C 8-bit expansion port Cassette MIC,EAR,REM 1000 baud.
Operating system	MS-DOS v 2.0
Dimensions	326mm × 305mm × 87.5mm
Weight	4.3kg



BANKS' STATEMENT

Intimidation

It's the Valentine's Day Massacre revisited with software reviewers lined up against the wall and producers with their fingers on the trigger. Martin Banks turns his collar up to investigate intimidation in the computer industry.

The night was dark, very dark. The light from the nearby street lamp struggled and barely reached the ground to lie in a useless yellow pool. It had been raining.

Indoors, Arnold sat in the dark watching his TV screen. He was at it again. His mother had told him about it, told him he would go blind, but he didn't care. The money was good, and he was starting to make a name for himself. 'I'll try this game one more time and then write the review,' he told himself.

His concentration was broken momentarily as he heard a car pull up outside, then another. In all, seven doors slammed shut and there was the sound of many feet and raised voices. 'Where is da punk?' said one. 'Over there, number 34,' said another. This took Arnold's interest and shook it a bit. He lived at number 34. He rose, went to the window and looked down on the big black Chevvies parked outside, and at the seven big men with violin cases who were walking up the drive to his house. 'Not the Amadeus Quartet,' he surmised.

As they broke down the door and pushed his mother aside, the seven men met Arnold as he came down the stairs. 'Dere's da punk,' said one with an appallingly false Brooklyn accent, 'grab him.' This they duly did, taking him forcibly into the front room.

'What do you want?' asked Arnold, beginning to suspect that all was not right with the world. As six of them took stout sticks from their violin cases, 'Brooklyn' spoke. 'We represent Ultra-Punk Software, the like of which you've maybe hoid (Brooklynspeak for heard). You wrote a review about dis noo game dey got called 'Up Yours With A Space Invader' and de boss he ain't likin' what you wrote, right?'

Realisation was dawning on Arnold. 'All I said was that it was pretty boring, just another Space Invader blob rip-off and not worth the £7.99 being charged; and it's all true.'

'Da boss don't give a damn whether it's true, he just wants us to correct the mistaken idea you have that you can write the truth in a review,' said Brooklyn. 'He wants us to get across to you the fact that you have hurt both his feelings and his potential bank balance. He sees no reason why punks like you should stop him becoming a rich man just by writing the truth.'

The other six gathered closely around Arnold as Brooklyn continued. 'So, Arnold, the boss has told us to come and visit with you and even things up a little. As you have hurt his feelings, he has told us to hurt yours. I think, boys, that we'll start with his legs . . .'

Well, I've managed to shake off this strange urge to try and write like a third-rate Micky Spillane. I am, however, still left with the bare bones of what I'm going to write about — a nasty word; one that the computer industry should be above (even though we all know that no industry is above it, should it prove either necessary or useful). That word is intimidation.

There are rumours flying around that one or two reviewers have been, how shall we say, 'advised' that recent reviews they have given to games programs have been 'unsatisfactory'. The advice has not come from the editors or even the publishers of the magazine: it has come instead from the producers of the game.

What they would like, it would appear, are nice, well-written and above all, favourable reviews of their games. What they are prepared to offer the reviewers as their part of the bargain is not (necessarily) products that are worthy of the plaudits expected. No, what they are prepared to do is come round and visit a reviewer who proves to be recalcitrant, and offer to 'sort' the reviewer out. This, as we all will understand, is *not* a reference to a database management function.

I suppose it's inevitable that such offers will be made by some of the companies in the home computer software business. After all, there appears to be a veritable goldmine to be plundered in all those users out there and companies are bound to feel entitled to a piece of the action, regardless of what they produce.

From the few examples I have seen of some of these games, two thoughts have developed. The first is that many of these companies have a cheek trying to be in business at all, and the other is that if they took the creativity used to conjure up the wonderfully hyped storylines that explain the ninety-third, fourth-rate rip-off of Space Invaders they have produced and applied it to developing a different game, then perhaps they would fare better.

Let's return for a moment to the 'Micky Spillane' introduction to this piece. Let's suppose that the seven hoods achieve their desired objective and rearrange Arnold's thought processes so that he intrinsically feels that all the products produced by UltraPunk Software are wonderful, and writes so. Even if the company has managed to similarly nobble every other reviewer, it cannot nobble the users; and there is an old saying that you cannot fool all of the people all of the time. In the end, UltraPunk will get found out anyway. Sure, the magazines will also get found out, and the users will stop buying them. This will leave UltraPunk with no-one reading the 'glowing' reviews, and no-one buying the wonderful games.

It's a sad indictment of the software industry that it even thinks in terms of breaking the legs of games reviewers who pan one of their products. Apart from anything else it demonstrates what little faith it has in its own products and creativity, as well as showing that it probably lacks the maturity to run its affairs in an orderly fashion. This, of course, leaves it open to a wide range of expert con-men and skimming artists.

Once these characters become involved, the needs of the users become of little relevance, just so long as they keep paying for the products. As has been seen in the publishing business, the companies don't always pay their own way, even though they get the money from the end users just as fast as it can be dragged out of their pockets.

There was a time when the micro business was fun, when it was full of lovable rogues and con-men such as . . . well, no names, no libel suit. Certainly they would stitch you up if they got the chance, but offer to break your legs? It was generally unlikely. Now it seems to be almost common.

Ho hum, see you in hospital. **END**

Portrait by Eddi Gornall Illustration by Paul Allen



Memory Map Conversion

Peter Pendlebury examines the 'compatibility' of the Tandy Color Computer and the Dragon by showing how to convert Tandy programs using the Dragon's keyboard memory map.



Photography by Chris Stevens

While reading a copy of *80 Micro*, an American magazine devoted to TRS-80 computers, I came across an article entitled 'The Poop on Peek'. This article contained a keyboard memory map for the Color Computer. As a Dragon owner, I knew that the Dragon and the Color Computer were 'more or less' compatible machines, so I decided to use the information in the article for my own programs.

I soon discovered that although 'more or less compatible' meant that the keyboard memory in both computers is in the same set of memory locations, the two computers output different data values to these locations when a key is pressed. For example, when the 'A' key is pressed, the following occurs:

Color Computer: memory location 339 contains 254.

Dragon: memory location 339 contains 251.

This means that if you have a Color Computer program for your Dragon that doesn't work when you press a key as directed in the instructions, you could use the information given here to convert the program.

The following program will reveal the contents of the Dragon's keyboard memory when any key is pressed. The same applies to the Color Computer.

```
10 REM KEYBOARD PEEK PROGRAM
20 CLS
30 L = 337
40 FOR P = 0 TO 256 STEP 32
50 PRINT@P,L,PEEK(L);
60 L = L + 1
70 NEXT P
80 GOTO 30
```

If you type in and run the program you will see the following display:

337	255
338	255
339	255
340	255
341	255
342	255
343	255
344	255
345	255

If you press the ENTER key you will see:

337	191
338	191
339	255
340	255
341	255
342	255
343	255
344	255
345	255

For the purpose of checking which has been pressed, only locations 338 to 345 need to be considered. Location 337 must also be checked to ascertain whether a shifted key has been pressed. I went through all the keys and produced the table shown in Fig 1 above.

	Contents of location						
Location	254	253	251	247	239	223	191
338	0	8	@	H	P	X	ENTER
339	1	9	A	I	Q	Y	CLEAR
340	2	:	B	J	R	Z	
341	3	;	C	K	S	↑	
342	4	,	D	L	T	↓	
343	5	–	E	M	U	←	
344	6	.	F	N	V	→	
345	7	/	G	O	W	SPACE BAR	

(All values decimal)

Fig 1 Dragon keyboard PEEK table

The Dragon keyboard memory is located from 338 to 345. When the keyboard is waiting for an input, each of these locations will contain 255 (decimal). When any key is pressed one of these locations will change in value.

To use the table, decide which key is to be checked. To see if it has been pressed, let's use → as an example:

1) Find → in the table.
2) Look to the left of the table to find the location — 344
3) Look to the top of the table to find the contents of the location if the → key is pressed — 223




```
100 IF Y > 30 THEN Y = 30
110 IF X < 1 THEN X = 1
120 IF X > 63 THEN X = 63
130 GOTO 35
```

If you enter and run this program, you will find that to draw a line you will have to press and release the appropriate key many times.

Using the information in Fig 1 you can rewrite the program as follows:

```
 10 CLS0
 20 X = 32
 30 Y = 16
 40 SET(X,Y,RND(8))
 50 IF PEEK (341) = 223 THEN Y = Y – 1
 60 IF PEEK(342) = 223 THEN Y = Y + 1
 70 IF PEEK(343) = 223 THEN X = X – 1
 80 IF PEEK(344) = 223 THEN X = X + 1
 90 IF Y < 1 THEN Y = 1
100 IF Y > 30 THEN Y = 30
110 IF X < 1 THEN X = 1
120 IF X > 63 THEN X = 63
130 GOTO 40
```

Using this program, you will find that doodling on the screen is much quicker and easier than with the INKEY$ program.

An explanation of the program follows:

Line 10 clears the screen.

Lines 20 & 30 set the point to start drawing — screen centre.

Line 40 sets a point on the screen with a random colour.

Lines 50 to 80 check if the ↑ ↓ ←→ keys have been pressed and draw in that direction.

Lines 90 to 120 keep the line within the screen boundary.

Line 130 loops the program.

To get out of the program press the BREAK key or add this line:

```
85 IF PEEK(338) = 251 THEN CLS:END
```

This checks to see if the @ key has been pressed and stops the program if it has.

Implementation

You will notice that the keyboard PEEK table gives you values in memory locations 338 to 345, but the keyboard PEEK program gives you the values in locations 337 to 345. For normal use, the table given in Fig 1 is sufficient but if you need to check for a shifted character or lower case you will have to use the program.

If you run the keyboard PEEK program again and press shift A, you will see that two locations change in value. To check for shift A in your program, the program line will have to read:

```
10 IF PEEK(337) = 187 AND PEEK(339) =
   251 THEN . . .
```

This method of PEEKing the keyboard memory map can be implemented on any computer that uses a memory-mapped keyboard. The only problem you may have is in finding out exactly where, in your computer, the keyboard memory is located. END

This means that if the → key is pressed, memory location 344 will contain 223.

In BASIC — 10 IF PEEK(344) = 223 THEN . . .

Very interesting, you say, but will it help my programming? This is best demonstrated by a couple of small application programs. You probably already know that the INKEY$ function can be used to check if a key has been pressed, but its disadvantage is that it's a once only check. For example:

```
10 CLS0
20 A$ = INKEY$
30 IF A$ = "I" THEN A = A + 1
40 PRINT@70,A;
50 GOTO 20
```

If the above program is typed in and run, and the I key is pressed, the value of variable A will be incremented by 1. However, to increase A by 1, you will have to release and press repeatedly the I key.

Using the information given in Fig 1, the program can be rewritten as follows:

```
10 CLS0
20 IF PEEK(339) = 247 THEN A = A + 1
30 PRINT@70,A;
40 GOTO 20
```

If you run the above program and press the I key, A will increment by 1 each time the program loops, for as long as the I key is depressed. A less trivial program makes the point:

```
 10 CLS0
 20 X = 32
 30 Y = 16
 35 A$ = INKEY$
 40 SET(X,Y,RND(8))
 50 IF A$ = CHRS(94) THEN Y = Y – 1
 60 IF A$ = CHRS(10) THEN Y = Y + 1
 70 IF A$ = CHRS(8) THEN X = X– 1
 80 IF A$ = CHRS(9) THEN X = X + 1
 90 IF Y < 1 THEN Y = 1
```



Oric Atmos

The launch of the Oric Atmos demonstrates the company's desire to improve its unwholesome public image caused by the Oric-1's defects. However, the radical restyling of the Atmos may arouse suspicions as to how far Oric has succeeded in rectifying the errors and deficiencies of its predecessor. Steve Mann reports.

When the Oric-1 first made its appearance early in 1982, reviewers were quick to pounce on the machine's — well, let's be charitable and call them 'idiosyncrasies'. The general consensus was 'nice machine, shame about the ROM', and the Oric, designed as a Spectrum-beater, was outsold comprehensively by its Sinclair rival.

There was a lot to be said in the Oric's favour: the Basic was (always excepting the bugs) more powerful than Uncle Clive's dialect; the keyboard, though hardly of professional quality, was certainly nicer to use than the 'dead flesh' Spectrum version; and the Oric featured a Centronics interface and RGB port as standard — something of an innovation in a computer of its price range. But the parent company fell victim to every mistake ever made by a home computer manufacturer — products were announced as available months before they were ready, the adverts extolling the new baby's virtues were prone to exaggeration and, most serious of all, in the rush to cash in on the lucrative Christmas market the Oric was put on sale with a severely defective ROM.

Review models were sent out to the press in hastily bodged-up form and with documentation so terse and full of error that even the syntax needed to load a program from cassette was printed wrongly. *PCW* received four different models before a (relatively) satisfactory version arrived. On one the editing functions were missing entirely, on the second the cassette interface did not work, on the third the picture broke up each time the sound control was used — and so on, *ad nauseam*. It's hardly surprising that the Oric received reviews which could best be described as 'confused' — it was difficult to know which features were representative of the finished product, and some magazines (but not, of course, this one) were even led to believe that the Oric could support a maximum of two colours in high resolution mode.

It appeared obvious that the company would have to produce an amended ROM, but in the intervening year nothing was heard of this. The documentation, too, was simply horrid — although the grosser mistakes of the derisory 60-page 'provisional' manual were corrected in a second and longer edition, there were still many omissions, much misinformation and almost as many typographical mistakes as *The Guardian* produces on a good day . . . Oric Products was strangely unforthcoming — the Tansoft-produced *Oric Owner* published 'patches' for some of the bugs, and Oric owners soon decided that they'd just have to make the best of things. Software support was slow off the ground and, although better-quality material has started to appear over the last few months, all the best writers seemed to be producing for the Spectrum. The one bright spot on the Oric horizon was in France, where the Oric won an award as 'best home computer'. This might have been not entirely unconnected with the fact that French TVs use a different system to those in the UK, but TV sets sold in France have built-in RGB inputs — and the Spectrum, like so many of the lower-cost home machines, has no RGB socket . . .

Then, to the surprise of all, at the beginning of this year Oric Products announced the new ROM — but encased in a new machine, the Oric Atmos. The new machine was similar to the old Oric, but would have a 'proper' keyboard, new documentation, and a bug-free Basic. Oh, and those long-awaited 3in floppy drives would be available, too. It was understood that production of the old Orics would cease forthwith, and at the time this article was written various upgrade options were being mooted — the most likely being that one Oric-1 plus £50 would get you a new Atmos, which otherwise would sell for around £170. The disk drives are still 'awaited', but Oric Products seems to have been telling the truth about everything else.

Hardware

The Atmos comes finished in a smart black and red livery, and the initial impression is that the machine is slightly smaller than its predecessor. This is an optical illusion — the dimensions of the two machines are identical, but the full-sized keys make the keyboard seem more cramped. The alphanumeric keys are black, with white markings, while the 'control' keys — that is, ESC, CTRL, DEL, RETURN, the cursor keys and the two shift keys — are red. Oric has continued its practice of having the cursor left and cursor down keys at one end of the space bar, while cursor up and cursor right are sited on the other side. Although emulating the Spectrum pattern on keys 5,6,7 and 8, this has always seemed slightly daft to me — I would have thought it would be more sensible to have left/right controlled by one hand and up/down by the other, as is done on the new Sinclair QL.

The keyboard action feels cheap but not unpleasant — hardly up to Electron standard, but comfortable to use and quite suitable for touch-typing. One problem I found with the new keyboard is that I kept hitting cursor left in mistake for SHIFT — on the old board there was a fair bit of space between these two keys; on the Atmos they jostle each other uncomfortably. The only other keyboard difference is the appearance of a red key labelled FUNCT — this doesn't actually do anything at present, but is apparently there in the interests of 'future expansion'. Other differences are merely cosmetic — the redesigned Oric logo now has a red 'go faster' stripe (I'm surprised there is no provision for a 'STEVE & DEIRDRE' sticker above the keyboard) and there is a curious stippled effect moulded into the plastic at top left; this gives the impression of being a speaker grille, but in fact the speaker is more central and faces towards the base anyway.

Inside, the PCB is virtually identical to the Issue 4 Oric-1 design — in fact, both Oric-1 and Atmos bear the legend 'Oric -1 Issue 4. Designed by Tangerine Computer Systems Ltd'. The two EPROMs of the Oric-1 have been replaced by a single ROM, marked 'Oric Basic V1-1'. There's a gap where there once resided IC11, and RAM chips are numbered differently, but that's all. The board has a very 'finished' look to it: there are no patches or stray leads to indicate late design changes, and the

whole thing gives off a reassuring air of stability and good design. Communication with the outside world remains the same as on the Oric-1: reading from left to right you will find the TV socket, RGB and tape sockets, Centronics interface for printer, expansion port and power input. This time all connections are labelled, although it is a pity that Oric did not take the chance to add a power switch, as the socket on older Orics was notoriously wonky and the constant plugging and unplugging of the power lead can certainly do no good. The 'warm reset' button remains hidden beneath the case, and needs a pencil or screwdriver to reach it.

Also accessible via the underside are two 'trimmers' for adjusting the display: the Atmos is set up for an 'average' TV, and it may be necessary to give the trimmers a tweak or two to get the best possible display with the minimum of dot crawl. I found that the display was very satisfactory, with none of the picture deterioration that used to accompany a sound command on the Oric-1. Of course, if you're lucky enough to own an RGB monitor, you can have superb displays without having to bother with a TV at all.

Basic

In this section, I'll assume that the reader has a working knowledge of Oric Basic, and will content myself with detailing any changes/improvements in the Atmos version.

A major complaint by Oric-1 users was the machine's inability to save and load data direct from Basic. The only new keywords on the Atmos — STORE and RECALL — allow real, integer or string arrays to be saved on cassette and loaded into memory. In addition, the CLOAD command has been improved, with the facility to append either 'v' or 'j', for verification and joining of programs. It should be stated that the 'j' command does not give a true merge — it merely allows two different programs to be held in memory at the same time, and the section to be joined must not contain any duplicate or lower-numbered program lines. CLOAD has also been made more informative — the 'message line' at the top of the screen now lists programs and data by name as the tape plays, and differentiates between Basic and machine code programs.

The PRINT command has also been updated — there is now a PRINT @ facility, which takes the form PRINT @ x,y where x and y are row and column numbers. This is available in TEXT or LO-RES modes only, and supplements the PLOT command which does basically the same thing but allows attribute characters to be incorporated to give effects such as flashing, multi-coloured text. CHAR must be used to position text on the hi-res screen.

Of the well-known Oric bugs, perhaps the most famous (or should that be 'notorious'?) was TAB, which needed 13 to be added to the column number to produce the required result. This has now been cured, but it should be noted that the tab position must be calculated from the first (protected) column position, and TAB prints spaces instead of simply moving the cursor to its new position. The Atmos ELSE functions correctly, unlike its predecessor, and the STR$ bug (in which a spurious CTRL-B character was inserted at the beginning of each string, causing the string to be printed in green) has been conquered, although it should be noted that Microsoft Basic assumes that the first character is an assumed plus or minus sign, so functions like LEN must be adjusted accordingly.

Bugs apart, Oric Basic has always been a pleasure to use, despite the lack of such things as named procedures and despite the fact that variables may be given names of up to 16 letters although only the first two are acted upon. It is also annoying that variables containing reserved words may not be used — so a variable called TOTAL is not allowed as it contains the reserved word 'To'. These reservations aside, the presence of IF . . . THEN . . . ELSE and REPEAT . . . UNTIL, plus DEEK and DOKE and the ability to define a function in machine code using the ampersand, as well as the more usual Basic DEF FN make it a relatively powerful yet easy to use language. The improvement in documentation has made machine level programming that much easier, and hackers familiar with the 6502 should find much to delight them here.

I've never really been a fan of the serial attribute system for providing colour and special effects, but the memory this method saves is an undeniable attraction. At power-up, the Atmos proudly declares '37631 BYTES FREE', which is considerably more free memory than most other home computers can boast. The Atmos has a full 64k of RAM, 16k of which is overwritten by the ROM; this may be masked out to allow the full complement of RAM to be accessed if Basic is not used. Graphic resolution is certainly adequate at 200 by 240 pixels — this may not sound a lot when compared to, say, the Beeb but the latter's highest resolution mode will leave only a few kbytes for the programmer. The serial attribute system means that much less memory is needed to set up colour displays, but the drawback is that complex screens using many colours in close proximity can be difficult to set up. TEXT and LORES0 modes are virtually identical, allowing 27 lines of a theoretical 40 characters (in fact at least one and often two columns are 'protected' for use by the serial attributes and may not be used for



Radical restyling and colour contrast: the Atmos has a high-quality professional keyboard and contains the long-awaited ROM chip.



displaying characters). LORESI is a Prestel-style mode that displays graphic blocks,. User-defined characters are easy to set up, with both the standard and 'alternate' character sets available for redefinition by the user. Interestingly, Oric does not use the full 8×8 grid, but defines characters on an 8×6 matrix.

Sound has always been a major plus-point for the Oric, with the familiar AY-3-8912 chip providing three music channels, plus white noise facilities. Sound commands and pre-defined effects remain identical to those on the Oric-1, and the volume and range of effects compare very favourably with micros like the BBC or Commodore 64.

Early Oric-1s were plagued with loading and saving difficulties, which was odd, given that the machine used the Tangerine format which had proved successful over a long period. Later Oric-1's appeared to have overcome these problems, and certainly the Atmos proved itself very reliable at both fast (2400 baud) and slow (300 baud) settings over a wide range of different volume and tone settings. The addition of STORE and RECALL makes the Atmos cassette-handling even more powerful.

Compatibility

And now the bad news . . . Although the Atmos is designed to eradicate the ROM faults of the old Oric-1, programs designed for the older machine are unlikely to run on the Atmos. Many of the ROM routines have different start addresses, and system variables have been changed. I have tried a selection of Oric-1 software on the Atmos and, although I managed to get most of it to load — at least partially — none would run.

Documentation

After the horrors of the Oric-1 manual, with its crudely drawn cartoons, its typographical mistakes and its sometimes downright misleading 'information', the Atmos manual comes as a very welcome surprise. All of the machine details that Oric Products has hitherto been so reluctant to reveal are here and, while it may not be suitable as a sole reference work for a complete newcomer, it will certainly be a godsend to anyone who has upgraded from the Oric-1.

The writing style is slightly drier than the usual computing books and manuals — which is a welcome change from the usual awful puns and cutesy prose. Ian Adamson, the author, works his way through the material carefully and methodically, introducing each aspect of the machine in turn.

The 'meat' of the book is the section on Basic keywords, which takes each one alphabetically, gives the ASCII number of the keyword's token and shows the format needed to use it, and where necessary includes a short program to show the keyword in use. The chapter on machine code, and the section on Input/Output are also worthy of special note, as are the 12 appendices, which cover everything from escape codes and 6502 op codes through to the ROM routines and addresses and details of the I/O circuitry. All in all, a most useful and well thought out piece of work.

Conclusions

This is the machine that Oric Products should have used to launch itself into the home market. Even if the company had elected to miss the money-making Christmas market of 1982 and had delayed for a whole year, the result would have been far better than the situation that has prevailed over the past year.

To a certain extent, the Oric was a victim of bad press, but the blame for this must be laid squarely at the company's door.

The revamped Atmos is certainly a big improvement in every aspect. The new documentation and the debugged ROM make the Atmos a positive pleasure to use, and my only criticism is that we've had to wait so long. I've always had a sneaking regard for the Oric, despite its faults.

With the Atmos, no qualification is needed — it's a fine machine, offering a very considerable challenge to the Spectrum and even to the Electron. The only trouble is this: the Spectrum is now two years old and has built up a huge software base, as well as selling to over a million people. The Atmos may well be a worthy opponent, but the Spectrum must now be considered 'old' in computing terms. 1984 just might see some exciting developments at the low-cost end of the market.

The Atmos compares well with the Spectrum, but how will it stand up against the Elan Enterprise, always assuming the latter can meet its quoted specification at its quoted price at somewhere near its projected launch date? And here's another thought — I don't know how much the Atmos disk drive will eventually cost, but let's assume it'll be somewhere in the region of £200. This means that for £370, you can be the proud possessor of a neat, stylish home computer with a fair amount of user RAM and a single 3in disk, storing 160k per side. But spend another £30 and you can get a Sinclair QL with 200k of built-in Microdrives, four 'apparently superb' application programs, some concurrent processing, windows, 128k of RAM, and the option of a further 0.5Mbyte expansion. Now, which sounds the better bargain to you?

END

Benchmarks

The new Atmos ROM appears to offer a considerable speed improvement over the earlier Oric-1. For comparison purposes, timings are listed here for Oric Atmos, Oric-1 and Sinclair Spectrum. All timings in seconds. For a listing of the Benchmark programs see 'Direct Access'.

	Atmos	Oric-1	Spectrum
BM1	1.9	2.0	4.8
BM2	15.5	17.3	8.7
BM3	25.5	29.4	21.1
BM4	27.7	31.7	20.4
BM5	33.3	38.1	24.0
BM6	44.0	50.1	55.3
BM7	67.2	76.4	80.7
BM8	140.1	233.4	253.0

Technical specifications

CPU	6502A
RAM	48k (16k available later)
ROM	16k
Keyboard	57-key, qwerty, full travel
Display	Text: 27 lines of 40 characters (1 or 2 columns 'protected'); Lo-Res 1: Prestel-style block graphics; Hi-Res: 240 by 200 pixels, 8 colours
Disk	3in 40-track, 160 kbytes per side (formatted)
I/O	TV modulator, Centronics interface, RGB, cassette DIN socket, expansion port
Language	Extended Microsoft Basic

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TEACH YOURSELF ASSEMBLER

Paul Overaa completes his explanation of addressing with a look at the use of one address to 'point' to another. The three subroutines for last month's Connect Four game are also provided.

We can illustrate the general idea of indirect addressing with the following Basic example. You have a data file of one thousand items whose record lengths are 128 bytes long, and you wish to sort these items in order of bytes 6 to 20 of each record in order to perform processing.

An easy approach is to load just the fifteen bytes of interest from each record into a vector (one-dimensional array), INDEX$() and, in addition, create a 'tag vector', I%() to hold each record's 'record number'. Before sorting, I%() will contain the numbers 1 to 1000 in order. A sort is then performed and the I%() vector is rearranged to 'mirror' any physical (or logical) changes made in the index vector. After sorting, INDEX$() will be in the required order but INDEX$(5), for example, may not now relate to the 5th re cord of the data file. By searching through INDEX$() we effectively move through the data file in the sorted order but this is of little use unless we can access the corresponding data record. To do this, we use the 'tag' vector I%() that holds the corresponding original record numbers: the record number of the first record in the sorted order, whose index value is INDEX$(1), is found from I%(1). Similarly, the Xth item in the sorted order is obtained from I%(X).

We use the tag vector I%() to 'point' to the records in the data file. By using the Basic statement GET #1,I%(5) to obtain the fifth record in the new sorted order, we specify its address indirectly: in effect, the 'address' of the record in question is held in the variable I%(5).

Addressing an operand indirectly in an assembly language instruction is a similar exercise. We do not specify the operand's address, but rather the locations from which the address may be obtained. In the case of the Z80 and the 8080 processors, a form of indirect addressing known as 'register indirect' is available. It is a register pair, rather than a pair of memory locations, that holds the address of the operand.

On the 6502, the concept of 'zero page addressing' is used. 'Page zero' refers to the first 256 bytes of memory (addresses 0000 hex to 00FF hex), considered as a set of storage locations. A zero page address has the advantage that it can be specified with one byte (the high byte of the address will always be zero, and can be easily created as an 'implied high byte' by the processor).

Then, we could in theory use a zero page equivalent of Z80/8080 register indirect addressing. An indirect address held in a register pair of a Z80 processor would emulate an indirect address held in two bytes of zero page RAM on the 6502.

Things are slightly more complex because the 6502 does not, in general, implement simple indirect addressing. Instead, two forms of mixed 'indexed and indirect' addressing are available. One is called 'indirect indexed' and the other 'indexed indirect'. The single exception is the instruction JMP (address), which is a jump to the location specified by the contents of two bytes, address and address+1.

Indirect indexed

The 6502 uses the contents of the zero page byte specified within the instruction as the low order part of the indirect address. It also collects the contents of the next byte in the zero page and uses that as the high order part of the address. The indirect address obtained is then used as a base address for Y register indexing: that is, the contents of the Y register are added to the indirect address and it's this final address that is used.

It may appear complicated as a single operation but it helps to consider the two stages as separate actions. The 'indirect bit' is simply the specifying and using of the zero page locations as a 'store' for the base address. Once this base address is available, the indexing is performed in just the same way as absolute indexing (described last month). The advantages are that we don't have to specify the base address at the time we write the program, and that we can, during execution of the program, modify the contents of the zero page bytes to 'point' to any number of different base addresses as required.

If we wish to load the accumulator with the contents of an indirect indexed specified byte, the instruction will take the form LDA (zero page address),Y. The zero page address specified is then used to obtain the base address for the indexing (the general idea can be seen in Fig 1). If the zero page bytes held the address corresponding to the byte labelled BASE, we would then access the Yth byte of the set BASE,BASE+1,BASE+2, etc.

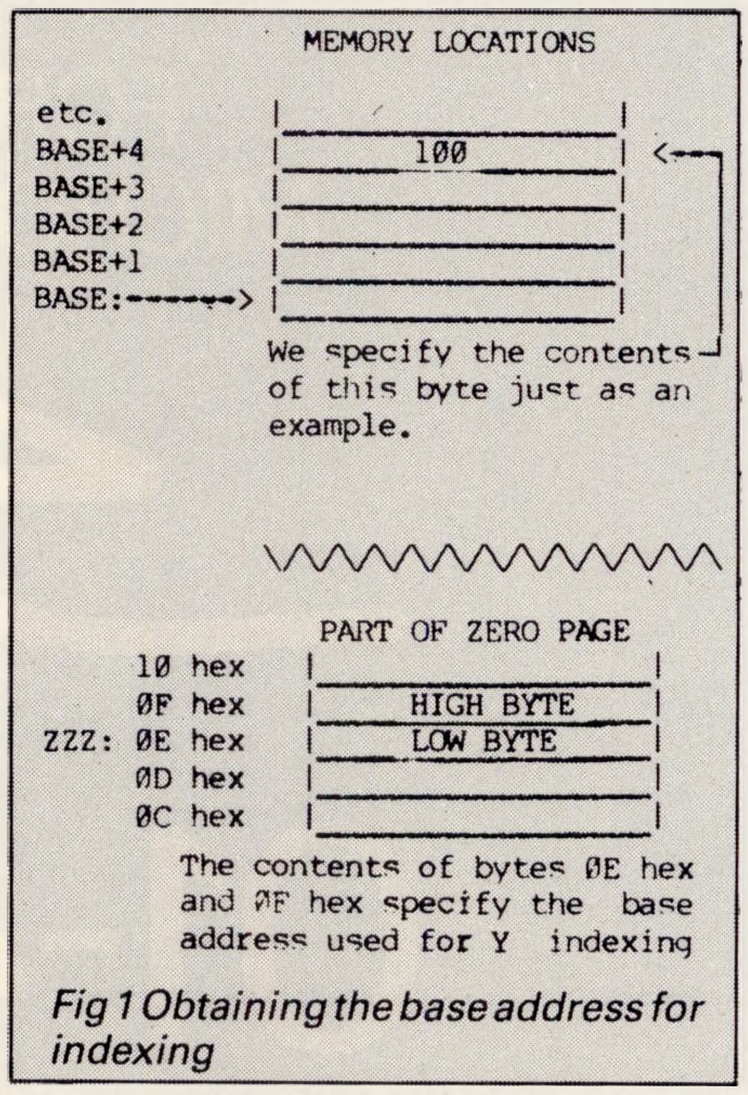


Fig 1 Obtaining the base address for indexing

If the Y register contained the value 4 then the instruction LDA (ZZZ),Y would result in the value 100 being placed in the accumulator.

Indexed indirect

This addressing mode uses the 6502's X register and performs the indexing first. In this case, a table or 'set' of addresses is held in the zero page. The X register provides the index offset from the base address and the contents of this byte, plus the contents of the succeeding byte which are used as an indirect pointer to another memory location. The type of instruction format required can be shown as follows: to load the accumulator, use LDA (zero page address,X); to 'OR' the accumulator, ORA (zero page address,X) should be used.

The requirement of a zero page address in both indexed indirect and indirect indexed addressing is a 6502 processor restriction and has nothing to do with the actual concepts of indirect addressing. Even bearing in mind such restrictions, you should be

aware that the 6502 implementation of indirect addressing is substantially more powerful than the simple register indirect form available on the Z80 and 8080 processors.

Connect Four

Last month we developed routines applicable to the game 'Connect Four' (see Subroutines A, B and C). These are first steps in such a development, but even at this stage the routines must be checked to ensure they work. A common technique (and one that is frequently used) is to write short 'test bed' controller routines — short patches of code that use the subroutines under development in order to check their performance. To illustrate how we go about this we've written a routine to test the subroutines featured here. The first job is to sketch out a brief 'controller structure' using a Warnier diagram as shown in Fig 2.

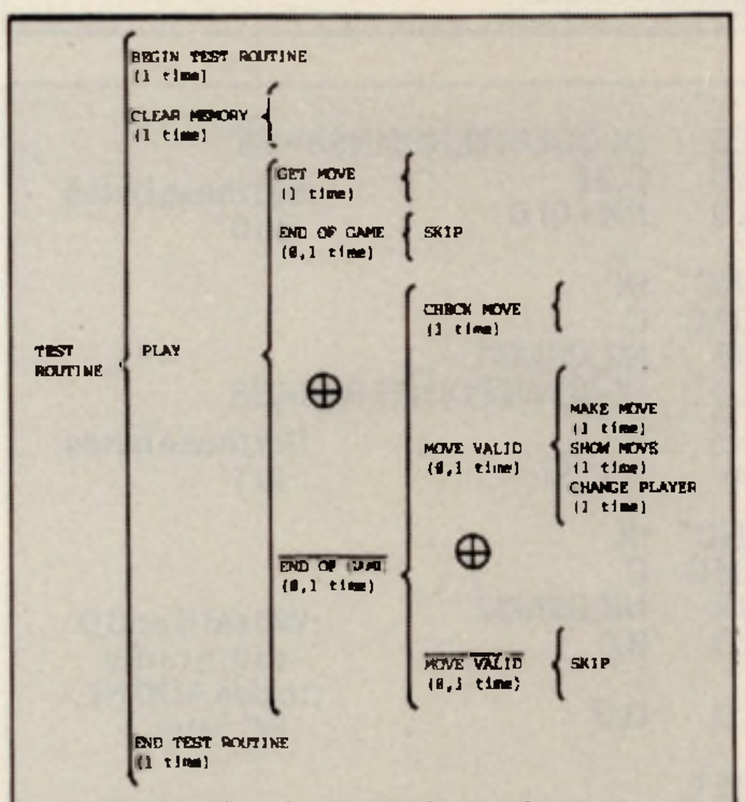


Fig 2 Test bed control routine

Most of the statements in Fig 2 correspond to existing subroutines. The 'end of game' statements imply that we can detect the end of the game. This we cannot do since no playing strategy is available yet. With this in mind, we must be satisfied with either testing the routines by using an 'infinite loop', or terminating the controller program when a particular keyboard character is detected.

We choose the latter option and use a carriage return to signify the end of game condition. We also need a temporary 'show move' code, and for illustration purposes adopt a simple solution — output the row number representing the position in the given column that the latest move will occupy. In writing the controller routine the aim is only to test the subroutines we have written. The controller block starts by clearing the memory, then we collect a character with the 'get move' subroutine. If a carriage return is detected we end the program, otherwise we check the move. If the move is illegal (a move to a full column) we ignore it, otherwise we make the move on the internal boards and display it by outputting the 'row number'. Finally, we change the player before returning to collect another move.

We have not included a check to ensure that any column number entered lies between 0 and 6 as this method of identifying a move is only applicable during the development stage, where such checks are not absolutely necessary.

In all three cases we have kept the test bed program listings separate from the listings of the developed subroutines, making it easier to see the basic ideas behind the controller routine and also allowing us to view the subroutines 'in isolation'. If problems occur, one useful tip is to modify the controller routine to eliminate calls to any suspect subroutines. To be safe, you may prefer to start with a controller routine that just calls the 'clear memory' subroutine. Once this is working satisfactorily the 'get move' subroutine can be included. In this way, the controller routine can be built up one piece at a time.

Internal boards

The internal representations of the boards may be examined in several ways. We might write a routine to display the contents of the bytes in binary form, use the system monitor to examine the bytes in question, or use a dynamic debugging tool (CP/M's DDT program, for example) that allows examination of memory areas during execution of a program. The binary display routine makes a useful exercise, and you may like to think about how it can be programmed. If you're not sure, have a look at the article on the Warnier techniques published in *PCW* (January 1983 issue). A memory dump routine was developed which gives plenty of clues.

The layout of the test bed programs is equivalent in all three processors (see Figs 3, 4 and 5). We start with a 'set up' block — defining equates, initialising stacks, and so on as required. The controller routine comes next, which makes calls to the various subroutines that have been developed. Immediately following this we place the subroutines we wish to test, including any other necessary routines: for example, any input/output routines needed. Lastly, we identify our data storage areas which 'sit' on top of the program.

END

An error crept into Fig 5 of last month's article.

The 6502 carry flag is CLEARED when the A register is < compared value. The BCC operands in the 6502 routines should therefore be changed to BCS.

SET UP BLOCK Z80 VERSION

```
CARRIAGE$RETURN     EQU  13
OPERATING$SYSTEM    EQU  5          ;Entry point
                    ORG  100H
                    JP   STACK
                    ORG  150H
STACK:              LD   SP,$—2
```

CONTROLLER ROUTINE Z80 VERSION

```
PLAY:       CALL CLEAR$MEMORY
            CALL GET$MOVE
            LD   A,C
            CP   CARRIAGE$RETURN
            JP   Z,FINISH          ;End of game
            CALL CHECK$MOVE
            JP   M,PLAY            ;Illegal move so
                                     ignore it
            CALL MAKE$MOVE
            LD   A,(HL)            ;Get row number
                                     for display
            OR   00110000B         ;Convert to ASCII
                                     equivalent
            CALL OUTPUT$ROUTINE    ;'Show move'
            CALL CHANGE$PLAYER
            JP   PLAY              ;Back for next
                                     move
FINISH:
            JP   0                 ;Re-boot
                                     operating
                                     system
```

IN THIS AREA PLACE SUBROUTINES
TO BE TESTED
(INCLUDE ANY I/O ROUTINES REQUIRED)

WORKSPACE DEFINITIONS

```
ROW$POINTER$BASE:    DS  7   ;Bit marked
                               'counter height'
COUNTERS$IN$BASE:    DS  7   ;Numeric form
                               'counter height'
SWITCH:              DS  1   ;Identifies
                               current player
BOARD$BASE$A:        DS  7   ;Player A's board
                               bit map
BOARD$BASE$B:        DS  7   ;Player B's board
                               bit map
```

Fig 3 Test bed program Z80 version

SET UP BLOCK 8080 VERSION

```
CARRIAGE$RETURN     EQU  13
OPERATING$SYSTEM    EQU  5          ;Entry point
                    ORG  100H
                    JMP  STACK
                    ORG  150H
STACK:              LXI  SP,$—2
```

CONTROLLER ROUTINE 8080 VERSION

```
            CALL  CLEAR$MEMORY
PLAY:       CALL  GET$MOVE
            MOV   A,C
            CPI   CARRIAGE$RETURN
            JZ    FINISH            ;End of game
            CALL  CHECK$MOVE
            JM    PLAY              ;Illegal move so
                                      ignore it
            CALL  MAKE$MOVE
            MOV   A,M               ;Get row number
                                      for display
            ORI   0011[illegible]0B ;Convert to ASCII
                                      equivalent
            CALL  OUTPUT$ROUTINE    ;'Show move'
            CALL  CHANGE$PLAYER
            JMP   PLAY              ;Back for next
                                      move
FINISH:     JMP   0                 ;Re-boot
                                      operating
                                      system
```

IN THIS AREA PLACE SUBROUTINES
TO BE TESTED
(INCLUDE ANY I/O ROUTINES REQUIRED)

WORKSPACE DEFINITIONS

```
ROW$POINTER$BASE:     DS  7   ;Bit marked
                              'counter height'
COUNTERS$IN$BASE:     DS  7   ;Numeric form
                              'counter height'
SWITCH:               DS  1   ;Identifies
                              current player
BOARD$BASE$A:         DS  7   ;Player A's board
                              bit map
BOARD$BASE$B:         DS  7   ;Player B's board
                              bit map
```

Fig 4 Test bed program 8080 version

SET UP BLOCK 6502 VERSION

```
CARRIAGE$RETURN     EQU  13
INPUT$ROUTINE       EQU  0FD1BH
OUTPUT$ROUTINE      EQU  0FDEDH
                    ORG  6000H
```

CONTROLLER ROUTINE 6502 VERSION

```
            JSR   CLEAR$MEMORY
PLAY:       JSR   GET$MOVE
            TXA
            CMP   #CARRIAGE$RETURN
            BEQ   FINISH            ;End of game
            JSR   CHECK$MOVE
            BMI   PLAY              ;Illegal move so
                                      ignore it
            JSR   MAKE$MOVE
            LDA   COUNTERS$IN$BASE,X ;Get row number
                                      for display
            ORA   #00110000B        ;Convert to ASCII
                                      equivalent
            JSR   OUTPUT$ROUTINE    ;'Show move'
            JSR   CHANGE$PLAYER
            JMP   PLAY              ;Back for next
                                      move
FINISH:     JMP   0                 ;Re-boot
                                      operating
                                      system
```

IN THIS AREA PLACE SUBROUTINES
TO BE TESTED
(INCLUDE ANY I/O ROUTINES REQUIRED)

WORKSPACE DEFINITIONS

```
ROW$POINTER$BASE:     DS  7   ;Bit marked
                              'counter height'
COUNTERS$IN$BASE:     DS  7   ;Numeric form
                              'counter height'
SWITCH:               DS  1   ;Identifies
                              current player
BOARD$BASE$A:         DS  7   ;Player A's board
                              bit map
BOARD$BASE$B:         DS  7   ;Player B's board
                              bit map
```

Fig 5 Test bed program 6502 version

```
CLEAR$MEMORY:  LD   IX,COUNTERS$IN$BASE
               LD   C,22
C$M$1:         LD   (IX+0),0        ;Set these bytes
                                      to 0
               INC  IX
               DEC  C
               JR   NZ,C$M$1
               LD   IX,ROW$POINTER$BASE
               LD   C,7
C$M$2:         LD   (IX+0),1        ;Set these bytes
                                      to 1
               INC  IX
               DEC  C
               JR   NZ,C$M$2
               LD   B,0             ;We set B and D
                                      to 0 in order
               LD   D,0             ;to use ADD HL,
                                      BC, later
               RET
```

GET MOVE Z80 VERSION

```
GET$MOVE:      CALL INPUT$ROUTINE
               AND  0FH             ;Mask upper four
                                      bits
               LD   C,A             ;Save column
                                      no. in C register
               LD   E,A             ;and as the board
                                      'A' offset
               LD   A,(SWITCH)
               ADD  A
               JP   M,G$M$1
               LD   A,E             ;Get column
                                      number back
               ADD  7               ;Board 'B'
                                      additional offset
               LD   E,A             ;Replace offset
                                      value in E
G$M$1:         RET
```

CHECK MOVE Z80 VERSION

```
CHECK$MOVE:    LD   HL,ROW$POINTER$BASE
               ADD  HL,BC           ;Effective HL+C
                                      since B=0
               LD   A,(HL)          ;Image of
                                      column's last
                                      move
               SLA  A               ;Left shift
               RET
```

MAKE MOVE Z80 VERSION

```
MAKE$MOVE:     LD   (HL),A          ;Replace
                                      updated column
                                      image
               LD   HL,BOARD$BASE$A
               ADD  HL,DE           ;Now HL points
                                      into boards
               OR   (HL)            ;Create new
                                      board image
               LD   (HL),A          ;and replace in
                                      memory
               LD   HL,COUNTERS$IN$BASE
               ADD  HL,BC           ;HL now points to
                                      count byte
               INC  (HL)            ;Increase
                                      numeric count
               RET
```

CHANGE PLAYER Z80 VERSION

```
CHANGE$PLAYER:  LD    A,(SWITCH)    ;Get current
                                      player
                CPL                 ;Complement
                                      the 'switch' byte
                LD    (SWITCH),A    ;Changed for
                                      next player
                RET
```

Subroutine A Clear memory Z80 version

```
CLEAR$MEMORY:   LXI   H,COUNTERS$IN$BASE
                MVI   C,22
C$M$1:          MVI   M,0           ;Set these bytes
                                      to 0
                INX   H
                DCR   C
                JNZ   C$M$1
                LXI   H,ROW$POINTER$BASE
                MVI   C,7
C$M$2:          MVI   M,1           ;Set these bytes
                                      to 1
                INX   H
                DCR   C
                JNZ   C$M$2
                MVI   B,0           ;We set B and D
                                      to 0 in order
                MVI   D,0           ;to use DAD
                                      instructions later
                RET
```

GET MOVE 8080 VERSION

```
GET$MOVE:       CALL  INPUT$ROUTINE
                ANI   0FH           ;Mask upper four
                                      bits
                MOV   C,A           ;Save column
                                      no. in C register
                MOV   E,A           ;and as the board
                                      'A' offset
                LDA   SWITCH
                ADD   A
                JM    G$M$1
                MOV   A,E           ;Get column
                                      number back
                ADI   7             ;Board 'B'
                                      additional offset
                MOV   E,A           ;Replace offset
                                      value in E
G$M$1:          RET
```

CHECK MOVE 8080 VERSION

```
CHECK$MOVE:     LXI   H,ROW$POINTER$BASE
                DAD   B             ;Effective HL + C
                                      since B=0
                MOV   A,M           ;Image of
                                      column's last
                                    move
                ADD   A             ;Effective left
                                      shift
                RET
```

MAKE MOVE 8080 VERSION

```
MAKE$MOVE:      MOV   M,A           ;Replace
                                      updated column
                                      image
                LXI   H,BOARD$BASE$A
                DAD   D             ;Now HL points
                                      into boards
                ORA   M             ;Create new
                                      board image
                MOV   M,A           ;and replace in
                                      memory
                LXI   H,COUNTERS$IN$BASE
                DAD   B             ;HL now points to
                                      count byte
                INR   M             ;Increase
                                      numeric count
                RET
```

CHANGE PLAYER 8080 VERSION

```
CHANGE$PLAYER:  LDA   SWITCH        ;Get current
                                      player
                CMA                 ;Complement the
                                      'switch' byte
                STA   SWITCH        ;Changed for
                                      next player
                RET
```

Subroutine B Clear memory 8080 version

```
CLEAR$MEMORY:   LDX   #22
                LDA   #0            ;Set these bytes
                                      to 0
C$M$1:          STA   COUNTERS$IN$
                        BASE—1,X

                DEX
                BNE   C$M$1
                LDX   #7
                LDA   #1            ;Set these bytes
                                      to 1
C$M$2:          STA   ROW$POINTER$
                        BASE—1,X

                DEX
                BNE   C$M$2
                RTS
```

GET MOVE 6502 VERSION

```
GET$MOVE:       JSR   INPUT$ROUTINE
                AND   #0FH
                TAX                 ;Column number
                                      (0-6) in X now

                BIT   SWITCH        ;N flag set if B's
                                      move
                BPL   G$M$1         ;(Branch if A's
                                      move!)
                CLC
                ADC   #7            ;Board B needs
                                      additional
                                      offset
G$M$1:          TAY                 ;Board offset in Y
                                      now
                RTS
```

CHECK MOVE 6502 VERSION

```
CHECK$MOVE:     LDA   ROW$POINTER$
                        BASE,X      ;Image of
                                      column's last
                                      move

                ASL   A             ;Shift contents to
                                      left
                RTS                 ;'N' Flag set if
                                      illegal
```

MAKE MOVE 6502 VERSION

```
MAKE$MOVE:      STA   ROW$POINTER$
                        BASE,X      ;Replace
                                      updated


                ORA   BOARD$BASE$A,Y ;Create new
                                      board image
                STA   BOARD$BASE$A,Y ;and replace in
                                      memory
                INC   COUNTERS$IN$
                        BASE,X      ;Increment
                                      numeric count

                RTS
```

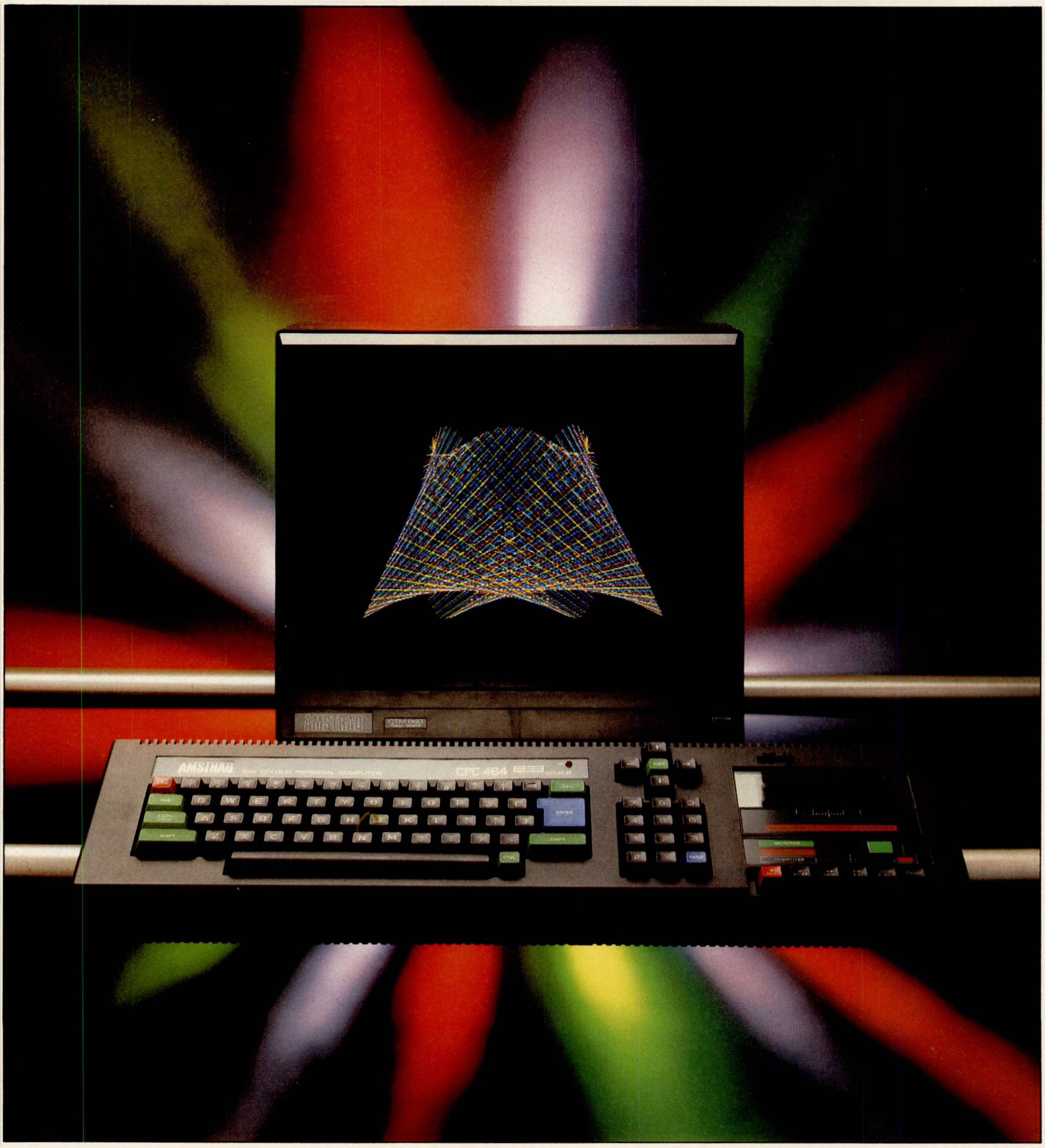
CHANGE PLAYERS 6502 VERSION

```
                LDA   SWITCH        ;Get current
                                      player
                EOR   #0FFH         ;Complement
                                      the 'switch' byte
                STA   SWITCH        ;Changed for
                                      next player
                RTS
```

Subroutine C Clear memory 6502 version

Amstrad CPC4 64

The time of true microcomputer consolidation is upon us in the shape of the Amstrad CPC464, which in two boxes and one lead includes a list of features that would shame a hybrid of the major machines. Guy Kewney examines this fast and powerful home/business micro which will be launched as a direct and effective competitor to the Commodore 64, Sinclair Spectrum and BBC Micro.



Photographs by Crispin Thomas

The moment when hi-fi broke away from its 'enthusiast' image and started appealing to the mass buyer is hard to pin down, but a major step must have been when suppliers put all the typical components into one neat and tidy box.

That moment may have come in the computer business with the arrival of a machine nicknamed 'Arnold'.

The Amstrad CPC464 is one of the first home micros to be sold with its own display (rather than a TV aerial socket), its own tape player rather than 'MIC' and 'EAR' sockets, and its own loudspeaker with volume control and no tangle of wires. It costs £200 for a high resolution monochrome (green) display version and £300 for a medium resolution colour display. It is a startlingly simple design with nearly all the better features provided by software, not silicon chips.

The list of features is considerable. It includes stereo sound, real-time interrupts, considerable ability to expand with external hardware, joystick port, built-in loudspeaker (and volume control), friendly Basic, automatic tape control, fast program loading and windows.

These features could have been provided on a Spectrum, if Sinclair had thought to put them in an Amstrad-type unit rather than supply them as components of a system which the buyer has to accumulate.

The Amstrad's designer, Roland Perry, made it clear that the package had been put together to compete with the Commodore 64, be better value than the Spectrum and decidedly cheaper than the BBC Micro.

What makes it different is not the price, but the fact that there are just two boxes and one power lead.

The display is plugged into the mains and you plug the computer, all in one box, into the display. This fits in with Amstrad boss Alan Sugar's idea of how the average British family buys electronics.

'Our concept has always been to supply a product that the consumer can use straightaway,' he said. 'And as it's too cumbersome to wrap the thing up in its cables and tuck under the bed, it'll have to be used!'

It is also likely to find its way into business use; with a disk, 80-column display and CP/M it will cost £400 or less.

The name 'Arnold' derives from the days when Perry was an outside consultant to Amstrad, and was talking about the still-secret project to software houses. 'It's a well-known consumer electronics group,' he hinted, 'and if I say that we've called the machine Arnold, does that give you a clue?' It did, but I don't know whether Sir Arnold Weinstock ever heard about the secret project under way somewhere in the GEC empire.

Hardware

As regards electronics there isn't much difference between the Amstrad and a Sinclair Spectrum. There is a Z80 talking to 64k of memory, a display controller talking to the same 64k, and a gate array. The gate array does the clever memory switching. Memory is arranged so that the 32k of permanent memory is split. The gate array can point either to ROM or RAM at the ROM addresses.

The top 16 of the 64k is either Basic or holds the screen contents. The 16k is either firmware or the area where the user's program code starts. A similar concept is used in the Commodore 64 to give more space than an ordinary 16-bit addressing micro can manage.

The bottom thousand-odd bytes is duplicated from ROM to RAM so that the all important restarts are available at the same address, whatever is happening with the gate array. The firmware copies itself into RAM at the same address at start-up. External control of the system is possible using this memory switching system. On start-up, the system checks all known memory addresses to see what is plugged in. Part of the check involves switching through 240 'pages' of possible external memory to see if anything is there. The program checks a particular memory location in the top 16k of each page and, if you plan to make an add-on, you must put its name in that location. Basic sits in page 1.

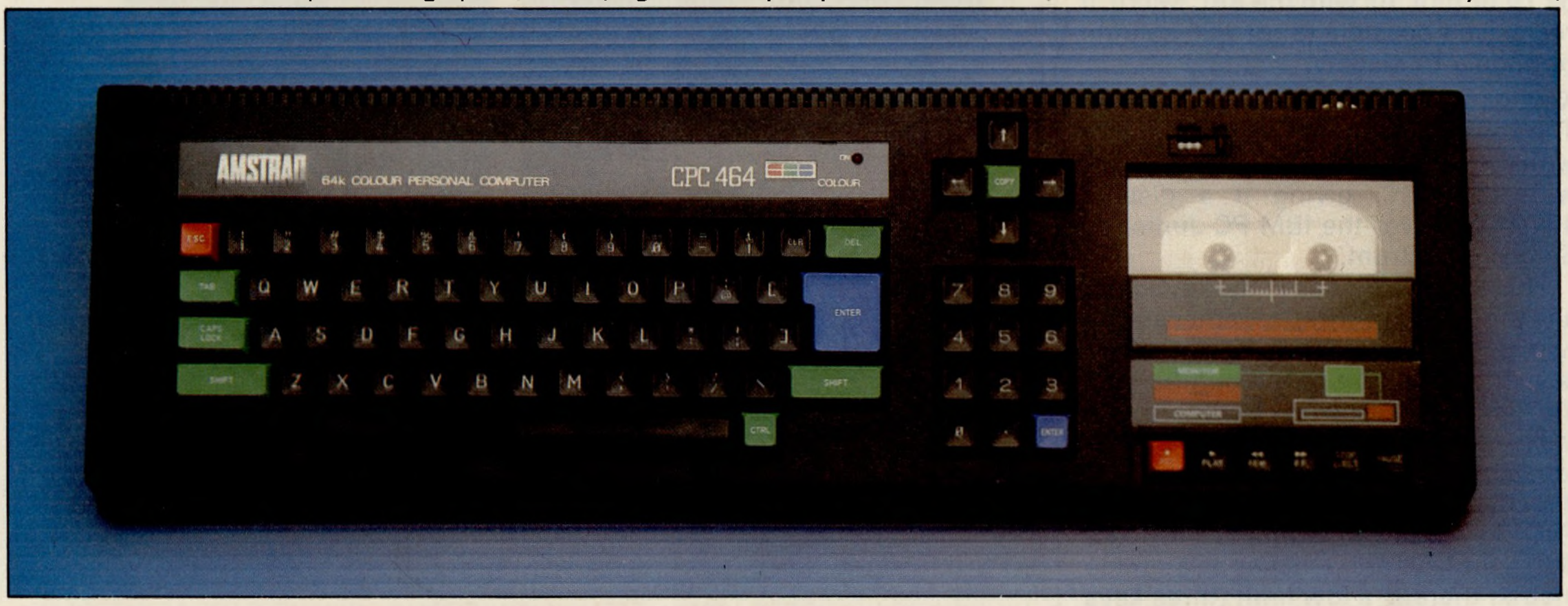
Computer enthusiasts will note that there is something with a higher priority than Basic, and that's whatever you choose to plug into page 0. The obvious thing is a plug-in ROM cartridge to drive the firmware. To make a ROM cartridge provide 16k of ROM, make sure it is addressed at page 0 out of the 240 extra, and read the Z80 chip signals on the expansion bus.

Communications with other systems can be handled through this port. On the back of the box the expansion port is labelled 'floppy disk' and will be used as such.

Control is passed to external memory by handing Basic a command beginning with a 'bar' |, followed by the name of the relevant ROM. Firmware will know the names of the top 16k pages. Typing |BASIC causes firmware to move to the start-up point of the Basic ROM, causing, in effect, a complete system reset.

The display controller and the processor are synchronised so that they never access memory at the same time. The effect of this on the processor is that it cannot process more than three machine cycles without going into a wait state. The software has been designed around this constraint for speed. Although theoretically the clock ticks three times for processor and once for display, giving a 25% degradation of processor speed, sufficient Z80 instructions fall inside the three-cycle boundary to improve on this (according to Locomotive Software, which wrote the operating code).

The hardware includes four sound generators triggered by software (three notes and one 'noise'), a standard industry feature. These can be modulated in much the same way as the BBC Micro sound channels. However, they have the unusual feature of stereo separation. The first channel is fed to the left side of the stereo output, the second is fed equally to both, and the third is fed to the right side alone. The sound emerges from a standard Sony Walkman outlet on the main keyboard,



The Amstrad CPC464: 'better value than the Spectrum, and cheaper than the BBC.'

and a headphone wearer will get full stereo sound. Amstrad is also stocking an optional accessory — a cable to link computer to hi-fi systems.

Also in the box is the cassette player/recorder. The advantage of having this supplied with the system is not just one of convenience: it also allows the software designer to work with a known standard cassette performance. Amstrad has taken advantage of this to provide a high performance tape: the cassette unit will record and play back at 2400 baud.

For safety, the designers have been slightly more conservative with two standard tape data speeds: 1000 bits per second; and 2000 bits per second. If Amsoft, the publishing division of Amstrad, decides that 2400 is safe, the user will never know because the detection of speed is entirely automatic on software load.

Display

The two monitors are standard so can be used for most other home micros with RGB output. The colour monitor is not the best in the world — an Amstrad TV picture tube — but compared with the display provided on a home TV through a UHF modulator, it is precise and clear.

The green screen is much clearer, and while no-one will really be happy working in 80-column mode on the colour tube, the green mono display is a good, standard 14in video output. The business user could have a green display at work and a colour display at home, carrying the compact console from one base to the other, but Amstrad suspects that people will buy a green screen and a modulator box.

The modulator box costs £30, and, like the monitors, provides low-voltage power for the computer. It has a colour output which will plug into an ordinary TV, producing a somewhat better picture than most British micros, which is to say, about as good as a Commodore 64 TV output. As with the BBC Micro, it really isn't possible to read 80-column print on a TV display.

Keyboard

The keyboard compares unfavourably with the Commodore 64 but is on a par with the BBC, giving it a distinct advantage over the IBM PC Junior or Sinclair Spectrum.

There are no diodes in the keyboard, and the only keys wired together are the two SHIFT keys. There is a numeric keypad in addition to the numbers on the top row of the qwerty keyboard, and the cursor and editing keys are separate too. Software can read the keyboard directly, making even SHIFT and CONTROL keys valid Basic inputs if needed. But as the keys are switches on a simple matrix, there is a low limit (three keys can be too many) to the number of buttons you can hold down together and still expect the computer to understand what you are doing.

The system reset is generated by holding down three keys together on the keyboard, SHIFT, CONTROL, and ESCAPE, in that order. It cannot be done by accident. Colour display is generated by the hardware, using a palette of 27 colours, and is modified by the software into three 'modes' of display. All other Amstrad features are provided by the software.

Expansion

The Amstrad is very expansible, but Amsoft, which will market the machine, is not planning to clutter up its catalogue with expansion items. The company will release an ordinary joystick, the modulator (for TV use) mentioned here , and possibly, one day, a serial interface.

Still secret, but much closer, is a design for a diskette drive. Locomotive is reportedly working on an extension to its Basic which will create disk files on an add-on device. The disk files are intended to be compatible with CP/M, and may well bear fruit before the end of the year.

It is likely to be a choice between the standard 5¼in drive and the 3in Hitachi drive.

Software

This falls into two categories: Basic and firmware.

Basic

This is fast, faster than nearly all other 8-bit Basics and some 16-bit Basics, too.

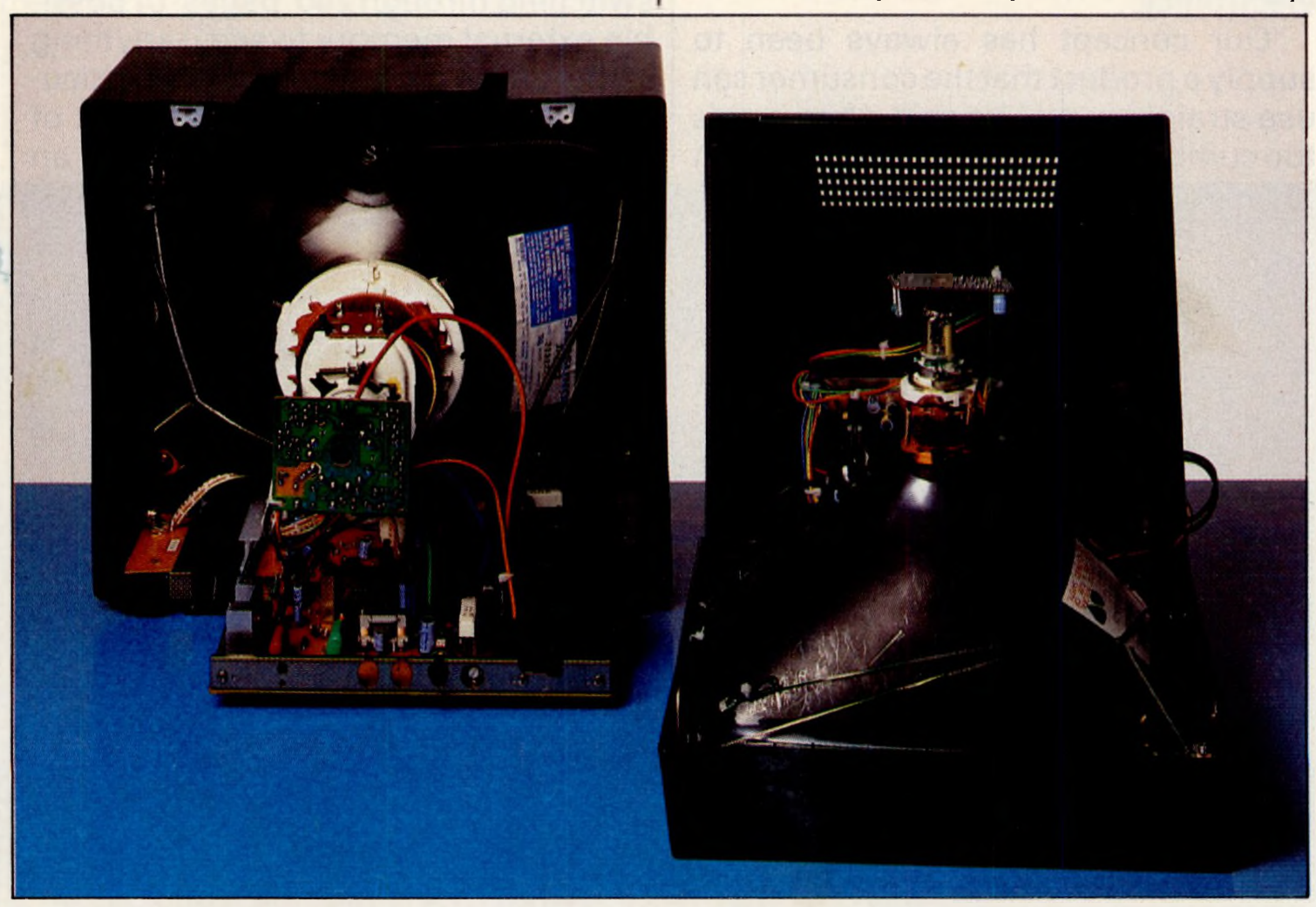
Locomotive Basic is known to some UK business users in an earlier version, which is almost indistinguishable from Microsoft standard Basic, right down to the editor. This is an enhanced version with many new functions in sound and graphics, and includes extra features to make programming less of a chore.

Locomotive believes it is perfectly sensible to write arcade games using this Basic, and that software houses are doing so. It says it is easy to write in, and very fast. Well, how fast is 'fast'? The value of the *PCW* Benchmarks is often doubtful, as many operations have to wait for information from disks and others depend on the time taken to draw shapes on the screen.

However, Benchmarks do test the ability of the Basic to do the arithmetic essential in plotting and drawing. On this system, plotting and drawing are done by the Basic and firmware working together and not by a special graphics chip, so the speed of the Benchmarks is more than slightly relevant.

The speed of Locomotive Basic has its penalty, however. It is achieved by clever use of the Z80 internal registers for storage of the main system pointers. Information about the next line to execute, where the variables are, and so on, is very quickly available to the interpreter, but there can be no recovery from a serious crash. It is not possible to create a command to correspond to the BBC Micro's 'OLD', which gets the amateur code writer out of trouble. Press RESET, and the system is irretrievably lost.

Several things about Locomotive Basic will surprise experienced Basic users. The list includes interrupts, streams, graphics, sounds and windows. The concept of 'stream' input or output is a foundation of Locomotive Basic. It's a neat way of arranging the odd collection of commands like PRINT, DISP, OPEN PRN and LPRINT. There are 10 input and output streams specified by the commands PRINT and WRITE for output, INPUT and LINE INPUT for input. They are referred to by



The colour monitor uses an Amstrad TV tube with RGB input

a number, worked out from a Basic variable.

Stream #0 is the main screen window. Until somebody defines it differently, it covers the whole area of the screen. A simple PRINT "PCW" statement assumes window #0, which is also stream #0, and so can be written as PRINT #0, "PCW". Streams 0 to 7 are screen windows, stream #8 is the printer, and stream #9 is the cassette output file. On input, streams 0-8 are the keyboard, with prompts sent to appropriate output streams. Stream #9 is the cassette input file.

The advantage of this is that a program can be tested on the screen display, and then easily altered to send output to the printer by using a variable, such as EPSON, as follows:

```
10 EPSON = 0
20 PRINT #Epson, "This is going to
   the printer"
30 DISPLAY = 0
40 Print #DISPLAY, "This is going to
   the screen."
   <other print statements)
1000 END
```

Until you have finished debugging the program and change line 10 to set EPSON to the number 8, all printer output will go to the screen. This is the only change the programmer has to make to switch streams.

At the moment, having two tape streams, one to read to and one to write, is nonsense as there is only one tape drive. However, one stream could theoretically be redirected to a disk when this becomes available. Input is also possible outside the stream concept, by directly reading the keyboard or the joystick port with INKEY and INKEY$, and JOY commands.

Windows are easily defined by the WINDOW command, which sets the window number, then the left, right, top and bottom corners. Each window has its own characteristics within the limitations of the display mode being used, but changing mode will reset all windows, including the graphics screen.

Graphics

Graphics on the Amstrad is a sensible collection of the more successful attempts at standard drawing and plotting commands on most established micros. The graphics commands are as follows:

CLG to clear the graphics screen.

ORIGIN sets the position of the 0, X and Y coordinates, and also defines the limits of the graphics screen window.

DRAW and DRAWR are absolute and relative line drawing commands; and MOVE and MOVER move the pen to the new plotting position without marking the screen in-between. PLOT and PLOTR similarly mark a single point either absolutely or relatively. TEST and TESTR move the cursor to a given point and report the ink colour used there.

TAG and TAGOFF allow Text At Graphics cursor for labelling diagrams. If the graphics routine has become confused with relative moves, XPOS and YPOS commands give the position.

Colour

Colour is very simple: explaining colour on the Amstrad is another story.

In mode 0, there is a 20-column (VIC-like) display, with 16 colours possible on screen. In mode 1, the screen moves to a 40-column display with four different colours, and in mode 2 to 80-column with two colours; except that there are 27 colours, all available to the three modes!

Roland Perry did his best: 'Think of each mode as having a certain number of pens, in which you can change the ink,' he said. 'In mode 0, there are 16 pens, in mode 1, there are four, and in mode 2, there are two.'

The trouble with this explanation is that a screen, already printed in INK 1, will entirely change colour if the program redefines INK 1. You might expect the following lines to change colour, and they do, but so do the previous ones, because you cannot get more colours on screen than the mode allows.

Ten minutes pushing keys makes it all quite clear, but hours spent with the manual are hours wasted in frustration.

Sound

Sound follows the BBC Micro's precedent in allowing complex sounds controlled by complex envelopes. On the Amstrad, you can use as little or as much of the ENVELOPE command's power as is required.

Sound is started with the SOUND command. All that is essential is the channel and the note. Optional features are the volume, the length of the note, and two envelopes.

A tone envelope controls variations in pitch and a volume envelope, called ENT and ENV respectively.

It's possible to synthesise very complex sounds with these envelopes, coupled with a sophisticated series of commands to ensure that chords synchronise with each other through sound queues, rendezvous parameters, sound queue flushing commands and sound hold commands.

Interrupts

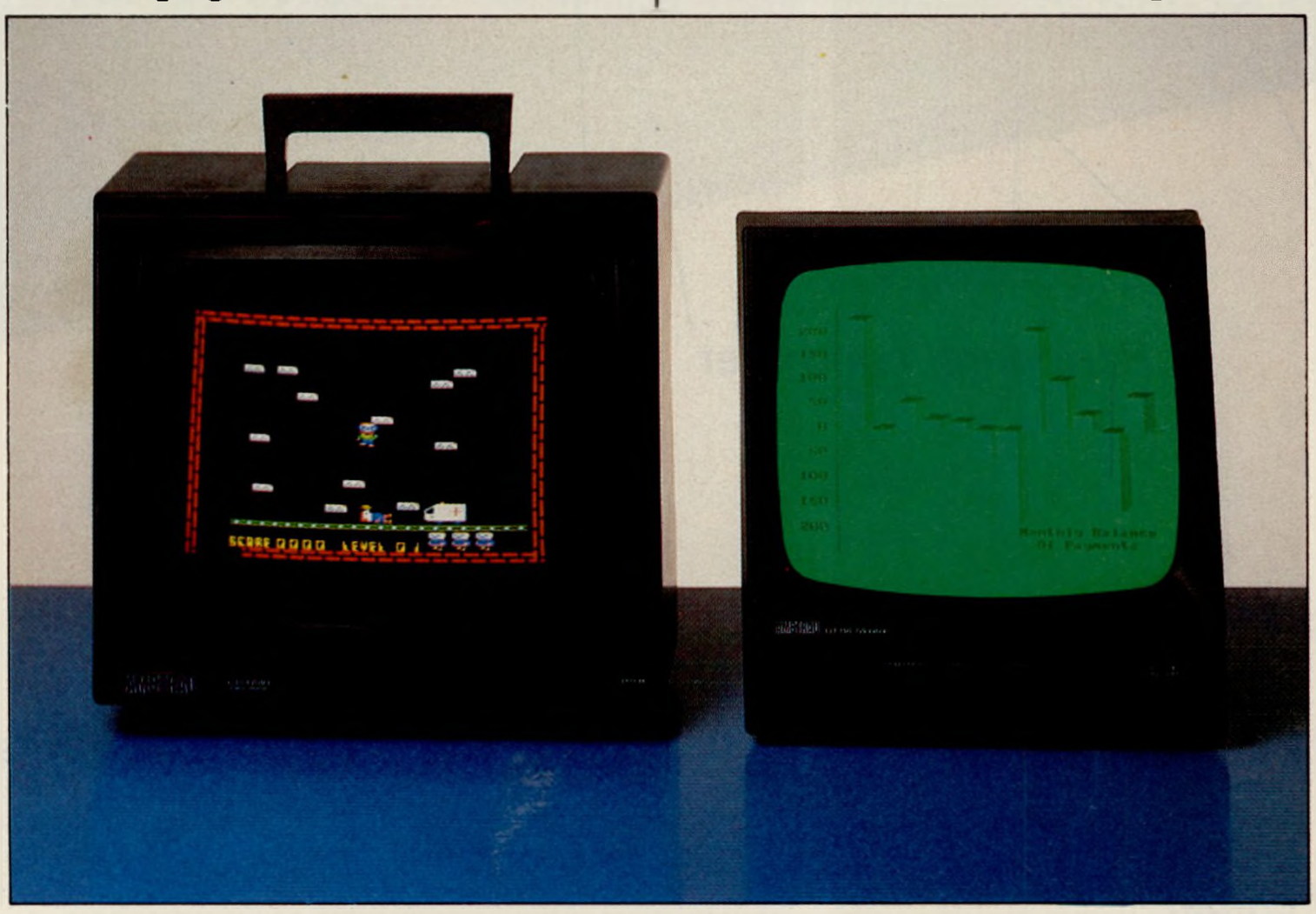
The machine has four internal clocks, which are available to the programmer and used to trigger interrupts. Interrupts have been, until now, something that only machine code chip programmers knew about. Basic ignored them. This machine allows the home programmer to discover the horrors of real-time code. You please yourself what you use them for, but the options are complex.

The command AFTER sets one of four timers (you specify which) to start counting in fiftieths of a second, and then generates an interrupt which leads to a subroutine, as in AFTER 100,0,GOSUB 1000, which sets timer zero to call subroutine 1000 after two seconds. The command EVERY does the same thing, but regularly.

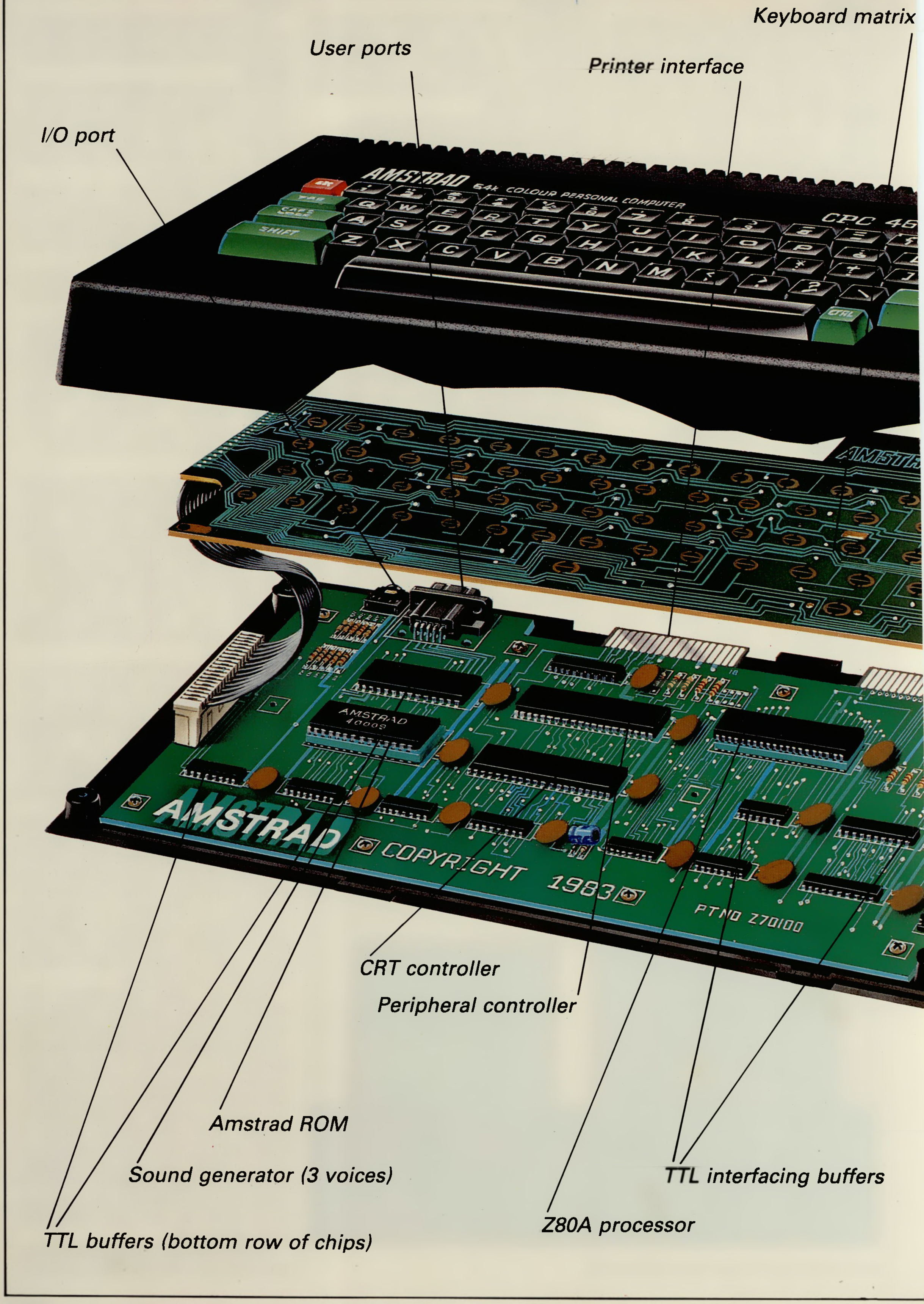
Timer 3 is the most important. Timer 2 and the three sound channel queues have equal priority, and timers 1 and 0 are lower priority, interruptible by just about everything. When executing an interrupt, it's advisable to make sure you can finish your routine by starting with a Disable Interrupts (DI) command, and to enable it again with EI when the routine is over.

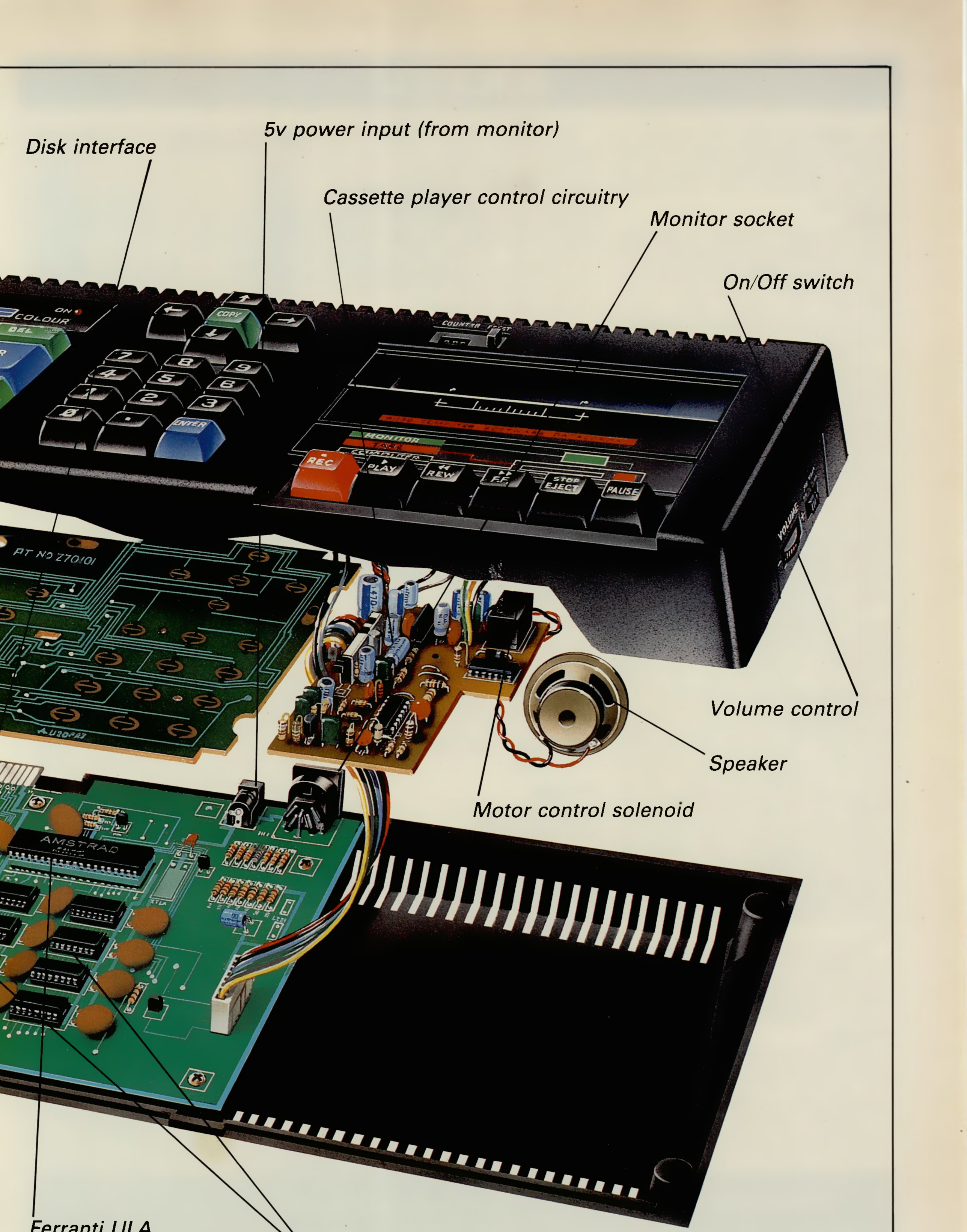
There are other innovations, too. PRINT@ doesn't mark the screen but returns the location in memory of the named variable. I also like the way the keyboard is defined: it can be read directly by key number, or indirectly by interpreting the ASCII code generated. The pattern printed on the screen is derived from information stored in ROM, and can be cleverly defined as being in RAM, too, with the SYMBOL AFTER command. SYMBOL AFTER 32 means that the ROM defines characters up to ASCII 32, and user definitions apply afterwards.

The ASCII stream can also be altered, and there are 128 characters available



Both monitors give a clear and precise display


Keyboard matrix
User ports
Printer interface
I/O port
AMSTRAD 64k COLOUR PERSONAL COMPUTER
CPC 46
AMSTRAD
40008
AMSTRAD
COPYRIGHT 1983
PT NO Z70100
CRT controller
Peripheral controller
Amstrad ROM
Sound generator (3 voices)
TTL buffers (bottom row of chips)
Z80A processor
TTL interfacing buffers


Disk interface
5v power input (from monitor)
Cassette player control circuitry
Monitor socket
On/Off switch
Volume control
Speaker
Motor control solenoid
Ferranti ULA
64k RAM
COLOUR
DEL
COPY
ENTER
COUNTER RESET
MONITOR
TAPE
REC
PLAY
REW
F.F.
STOP EJECT
PAUSE
VOLUME
PT NO Z70101
AMSTRAD

for redefining keys. It's possible to program the control-function of several keys to provide Basic keywords, as on the Spectrum and Commodore machines.

Editor

The firmware includes a powerful editor for the Basic programmer, which is as good an editor as is available on any micro today. It is derived from the Microsoft line number editor but is enhanced so much that its ancestry is quite lost.

A line of Basic, program or direct command can be typed at any point on the screen. Text can then be read into it from another part or parts of the screen, using the 'copy cursor'. It can be edited while you type by using the cursor keys. There is a flaw in this editor, hardly a disastrous one, but one which the user has to be aware of before use. The copy cursor is baffled by background colour different to expectation. Changing background colours is not a trivial matter, and the safe thing to do is to make sure you never change ink, pen or paper while editing a program.

The other editing mode is exactly the same as in Microsoft Basic. Line 25, for example, if it has a syntax error, will be presented to the user in edit mode when run. The line can be edited separately with the command EDIT 25. The editing commands for the line are proper line edit commands, with delete and insert, move to left and right of the line, top and bottom of the numbered line, or complete statement. Debugging is also controlled by Microsoft-like TRON and TROFF trace commands, which print the line number of each line before it's executed. LIST sends the Basic code to stream #0 unless otherwise specified: — for example, LIST #8 will print on the line printer, LIST #2 will send the listing to window #2, and so on.

Execution of a program is paused by one stroke on the ESCAPE key, and resumed by touching any other key. It takes two strokes of the ESCAPE key to cause a **Break**.

Firmware

Locomotive went to a lot of trouble to ensure that software houses could use the Amstrad firmware for machine code programs, as well as Basic. The list of available routines is long, and is published as an optional extra manual (which I'm told will not be cheap).

One section worthy of note is the feature which comes close to the *FX commands of the BBC Micro. This is the control character function. Type control-X and you get a strange graphics symbol. But type PRINT "^X" and the effect of the control character will be a system call. System calls produced from software in this way will clear the screen, empty a specified window from the top, beep, and so on.

Applications software

The drawback of any new micro is the lack of software, but Amsoft hopes to have 50 titles at launch.

The software designers at Locomotive believe that the extreme simplicity of the hardware and its close relationship to the Spectrum will enable Spectrum software to be transferred by the authors with minimal patching.

They also believe that within a couple of months software writers will begin to discover things that the published, open firmware makes possible on this machine, and which just aren't possible on older designs.

Documentation

The manuals were the only part of the system which I didn't see in final form. Printer proofs show that the designers and software designers have done a thorough job, and attempted to produce the sort of manual which the average user will find easy to understand.

Prices

Amstrad CPC464	
Monochrome display	£200
Colour display	£300

Benchmarks

BM1	1.09
BM2	3.28
BM3	9.16
BM4	9.61
BM5	10.20
BM6	19.03
BM7	30.18
BM8	34.20

All timings in seconds. For a full listing of the Benchmark programs see 'Direct Access'.

Conclusions

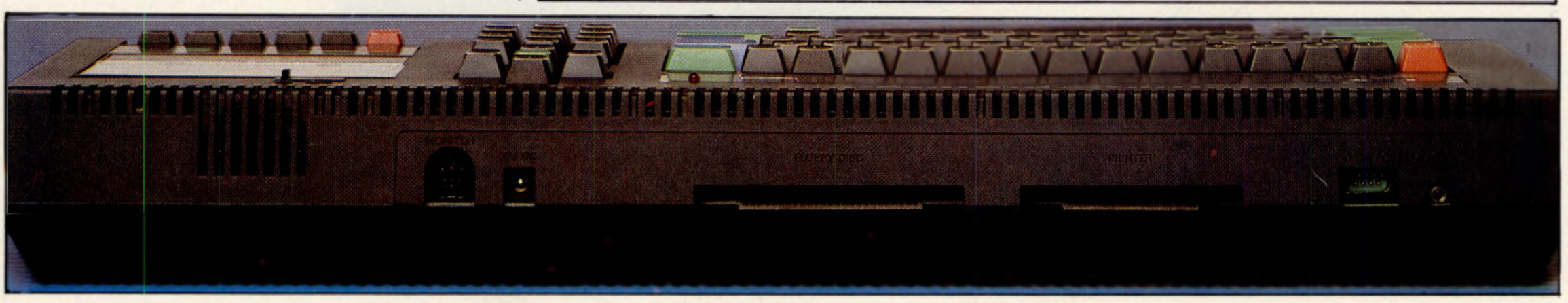
Like Amstrad audio equipment, the new computer is a good, honest functioning machine with several useful features that grander and more expensive machines lack. It represents a significant step forward, coupled with a real marketing breakthrough in the 'unit' approach and the inclusion of a quality display for under £300.

My dislikes were few. It should have an indicator light on SHIFT LOCK and CAPS LOCK; and the serial interface is more important (especially to Micronet and bulletin board users) than Amstrad realises.

The monitor, rather than TV output, is a very good idea; and a machine without a tangle of cables going to tape, power supply and domestic TV is excellent. The Amstrad is a powerful, fast machine, with plenty of memory, easy to program, and packaged in a way that means it will comfortably outsell the Acorn Electron, and give the Commodore 64 and Sinclair Spectrum a hard run for their money. I expect some 200,000 systems to be sold by the end of the year. END

Technical specifications

Processor	Z80
Memory	64k
Keyboard	Qwerty; numeric keypad
Display	80-column; colour and monochrome
Operating Language	Locomotive Basic
Interfaces	RGB monitor socket, power, disk, printer, user and I/O
Sound	Stereo; built-in loudspeaker and volume control
Applications	50 titles at launch date
Expansion	Joystick, TV modulator serial interface and diskette drive



From left to right: RGB monitor socket, power in, disk interface, printer port, user port and I/O

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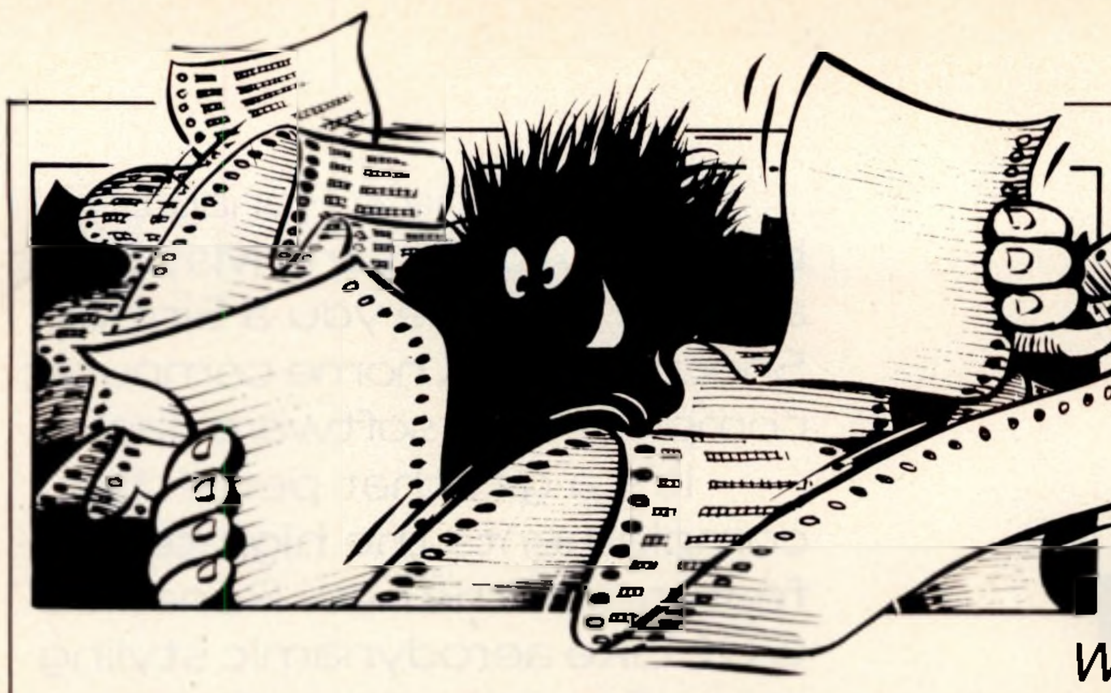
RENAULT recommend elf lubricants.

PCW 177



TJ's Workshop

Our monthly pot-pourri of hardware and software tips for the popular micros. If you have a favourite tip to pass on, send it to TJ's Workshop, PCW, *62 Oxford Street, London W1. Please keep your contributions concise. We will pay £5-£30 for any tips we publish.* PCW *can accept no responsibility for damage caused by using these tips, and readers should be advised that any hardware modifications may render the maker's guarantee invalid.*

Nascom tips

Here are two tips for the Nascom 2/3 range.

1) In educational applications it is often important to make programs as robust as possible. Unfortunately, the large inviting RESET key on the Nascom is usually the first to be tried. As this not only stops the program running but also leaves Basic and enters the monitor, it can cause a major problem.

If the Nas-dos operating system is in use, it is possible to intercept the chain of events caused by a reset. Nas-dos vectors a cold start through its workspace (Address 0D00 hex), so if the first line of a Basic program changes this vector to point to the execution address of the Basic program, when RESET is hit the program executes from the beginning again. This can be done using 10 DOKE 3329,–10243

After each reset the vector is changed to point to the normal Nas-dos address, so it is necessary to set up 0D00 after every reset (which the above does).

2) Having only an 8k Basic means that several useful features are missing. One of these is an INKEY/GET facility. The usual solution is a small machine code USR function which calls a monitor routine; but if only a limited facility is required (for example, when waiting for a key before scrolling or clearing the screen) then it's possible to read the keyboard port (port 0) directly from Basic. Each bit of port 0 (except bit 7, which is unused) indicates the status of one of the non-alphanumeric keys:

Bit 0 — Backspace
1 — Enter
2 — – <minus>
3 — Control
4 — Shift
5 — 0
6 — CH

Normally, all bits are 1 but when one of the above keys is pressed, the appropriate bit is set to 0. To wait for Enter to be pressed, use

100 K=INP(0) : IF K AND 1 THEN 100.

This is much nicer than 100 INPUT"Hit <ENTER> to continue . . .";A$.

Of course by combining the bit patterns it is possible to test for several keys being pressed simultaneously: 100 K=INP(0) : IF K AND 72 THEN 100. This will wait for CONTROL and CURSOR HOME to be pressed together, so if you use your Nascom for playing arcade games then this might be a way of detecting left/right/fire combinations.

PJ Dean

Lynx break

When programming in machine code, it can be frustrating to discover that your program is lost when an unintentional loop is entered and the only way out is to switch off the computer. The following piece of machine code will allow the use of the formerly redundant BREAK key. When used, pressing BREAK will restart the computer at 0000h, as though just switched on. It will not, however, lose the contents of RAM. The BREAK key sends an interrupt signal to the Z80 processor which causes a subroutine call (in mode 1) to location 0038h in ROM. The routine at this address causes a jump to location 6297h. Normally, a jump to this address causes a 'NOT YET IMPLEMENTED' error by jumping to 3B32h. If this jump is changed to 0000h the computer will restart.

All this sounds easy enough, but the BREAK key is not the only source of interrupts. The cursor output of the 6845 CRTC, which controls the video systems, also generates them. This source of interrupts must be disabled, achieved by putting a value of 23h into register 0Ah of the 6845 (a 6845 data sheet will provide details). The program is entered using the machine code monitor, and the BREAK key enabled by executing the routine at 6100h. It should be noted that after using the BREAK key once, or after running a Basic program, the enable routine must be used again. The routine can be run from the monitor using the command E or G 6100, and from Basic using CALL &6100. It can be saved to tape from the monitor using the command D 6100 6120 6100 "BRK KEY".

The program

6100 ED 56 21 00 00 22 98 62
21 C9 FB 22 2A 62 3E 0A D3 86
3E 23 D3 87 FB C9

Jon Chalmers

Sideways

This short routine provides an alternative character set in which the characters are oriented up the screen rather than across it — that is, they are turned on their side.

The program creates a redefined character set starting at 7168 dec. This is a handy location for new character sets since it allows a good deal of normal ROM-held character generator to be accessed by pressing the CTRL and RVSON keys, exactly as if you were calling for a character to be displayed in reverse video. All subsequent characters then appear as normal — not in 'reverse' — until CTRL and RVSOFF are pressed, when you are returned to the redefined character set. Thus, normal and 'sideways' characters can be displayed at the same time.

The routine works by reading the values held in each successive group of eight bytes which define the character shapes from the normal ROM character generator. The program uses the values for the first 64 characters to calculate new shape values for each character turned through 90 degrees. These values are then POKEd into the protected area of RAM at 7168. The pointers to the top of free RAM are lowered so the new characters will be unaffected by NEWing the VIC.

However, don't forget that as these pointers have been reset, there will now be less than the normal 3.5k available for the rest of your program — just over 3k in fact.

The program was written for the unexpanded VIC 20, but the listing should provide sufficient information to enable it to be modified for any size RAM expansion. For the 8k or 16k expanders, this generally entails moving Basic up above the specially reserved area of RAM, rather than lowering the top of memory.

The indentations of FOR — NEXT loops are provided for clarity but are not essential to the correct operation of the program. They may be removed along with all REM statements if desired. One unfortunate side effect of the program is that the cursor

T.J.'s Workshop

```
10 REM This is a genuine
20 REM NewBrain  listing
30 REM
40   REM Indenting is possible
50 REM
60
70
80 REM And so are blank lines
90 END
```

TRS-80 variable lister

In a large program it's easy to lose track of which variables have been defined as strings, which as integers, which as double precision, and which as single precision by the commands DEFSTR, DEFINT, and so on. The Basic routine below is a useful debugging tool which, when called by a GOSUB command inserted in the main program, lists the variable initial letters A-Z and the definition for each letter. Control is passed back to the main program by pressing any key.

To use the routine insert the line GOSUB 30000 into the main program at the appropriate point.

```
30000 FOR ZY%=16641 TO
   16666
30010 IF PEEK(ZY%)=2
   THEN ZY$="INTEGER"
30020 IF PEEK(ZY%)=3
   THEN ZY$="STRING"
30030 IF PEEK(ZY%)=4
   THEN ZY$="SINGLE"
30040 IF PEEK(ZY%)=8
   THEN ZY$="DOUBLE"
30050 PRINT
   CHR$(ZY%-16576);"-
";ZY$;STRING$(21,32);
30060 NEXT ZY%
30070 PRINT
30080 PRINT "PRESS ANY
   KEY TO CONTINUE"
30090 IF INKEY$="" THEN
   30090
30100 IF INKEY$<>"" THEN
   30100
30110 RETURN
```

AW Sheppard

PET restore

Here's a tip which will enable PET users to restore individual lines. Previously you could only reset the data statement pointer to the beginning of the first data line, but by POKEing the following addresses you can restore certain lines. The line number of the data statement must be broken down to the form:

Line Number=(X*1)+(Y*256)

This can be done using:

Y=INT(Line Number/256)
X=X-Y*256

The addresses are:

Basic 2.0
Poke 142,X Poke 143,Y
Basic 3.0 and 4.0
Poke 60,X Poke 61,Y

Richard Worthington

Epson printer reformatting

Here is a handy way of reformatting your printer listings. You may have had trouble in the past with the way the Apple sends out data—it is very wasteful of paper and often very hard to decipher. Before listing your program out, you may find it helps if you type the following:

PR#1<RET>
—Printer slot...
PRINT CHR$(9) + CHR$(1)
<RET>
PRINT CHR$(1) + "75N"
<RET>
—Then CAREFULLY!!...
POKE 33,20<RET>
LIST<RET>

You should find that the listing takes up the whole width of the paper, not just 40 columns.

Mark Edwards

Dragon old for new

One of the features sadly missing from Dragon Basic is the ability to OLD a program once it has been NEWed. When using machine code it is very easy to cause a program crash and so lose many hours of work. The routine below will reinstate any program that has been NEWed or lost due to a system crash (providing that the power supply hasn't been interrupted). The routine will bring back a lost program on entry of Exec 32750.

However, the program will only work if a new Basic line has not been entered or a new variable assigned.

```
10  CLEAR 200,32749
20  DATA 158,25,189,131,
    243,48,2,159,27,159,29,
    159,31,57
30  FOR T=1 TO 14
40  READ
    A:POKE32749+T,A
50  NEXT T
```

I am sure that this routine will be of use to many Dragon users.

Andrew Williams

Spectrum tab fields

The comma control character is very useful for tidying up screen displays; however, it is often desirable to fit more tab fields across the screen (that is, when printing reams of small numbers). The following function can be used in a computed TAB statement to divide the screen into tab fields of width f.

```
5 DEF FN t(f)=(33-PEEK
23688<f*
(INT(32/f)-1))*f*(INT((33-
PEEK23688)/f)+1)
```

To use the computed TAB you just put

;TAB FN t(f);

at the end of a print statement, as you would use a comma (f is the width of the fields—that is, the gap between tab positions).

Thus, to fill the screen with numbers from 1 to 100, using tab fields of width 4:

```
 5  . . as above
10  FOR n=1 TO 100
20  PRINT n;TAB FN t(4);
30  NEXT n
```

NOTE (33-PEEK 23688) gives the current print position. To use this method with the ZX Printer and an LPRINT statement, replace PEEK 23688 with PEEK 23679 (system variable P POSN).

This system should work with other micros but the following points shoud be noted for conversion:

33-PEEK 23688
Gives the current print position on a Spectrum
INT(32/f)
Where 32 is the screen width on a Spectrum

Replace these by the relevant expression for current position and the screen size on your micro in line 5 (the function definition).

Kevin Gaughan

VIC-20 Control codes

An extremely versatile yet unknown feature of the Commodore VIC-20 is the facility for inserting control codes in REM statements to format a program listing. Here are some useful sequences:

1 10 REM"" delete) (ctrl-rvs on) (shift M) (shift S) (unshifted J) (return)

Every time this line is met while listing, the screen will clear and then the listing will continue.

2 20 REM"" (delete) (ctrl-rvs on) (shift M) (unshifted £) (unshifted J) (return)

This line will cause the listing to continue in red. This can be changed by substituting another colour code for that of red.

3 Here is a list of control codes and their effects. They must be inserted between the shifted M and the j.

capital	T	Delete/back-space one character.
capital	N	Continue in lower case mode.
shifted	M	Force a linefeed.
capital	M	Return carriage.
capital	R	Continue printing reverse field characters.
shifted	T	Insert a space in line.
shifted	N	Continue in upper case mode.
capital	s	Home cursor.
shifted	s	Clear screen.

And, of course, all the colour codes. These codes also work on the Commodore 64 and PET (not colour codes).

R G Bhanap

END

BEYOND

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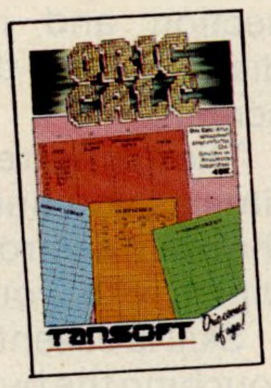
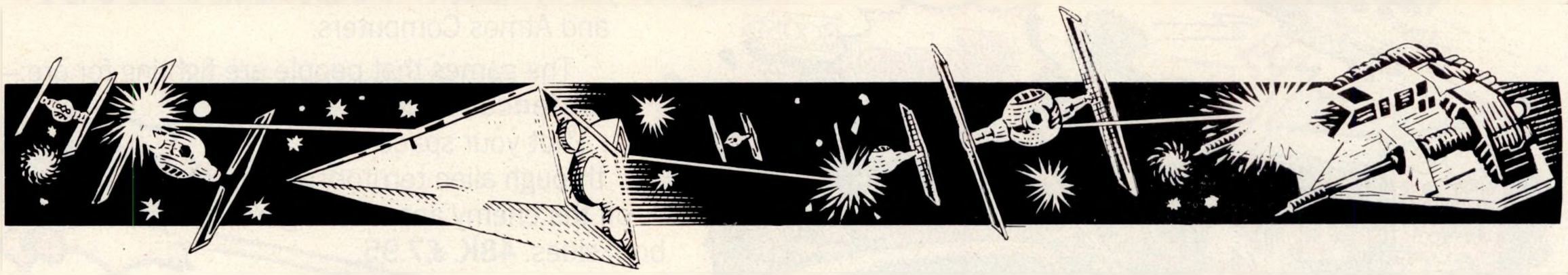


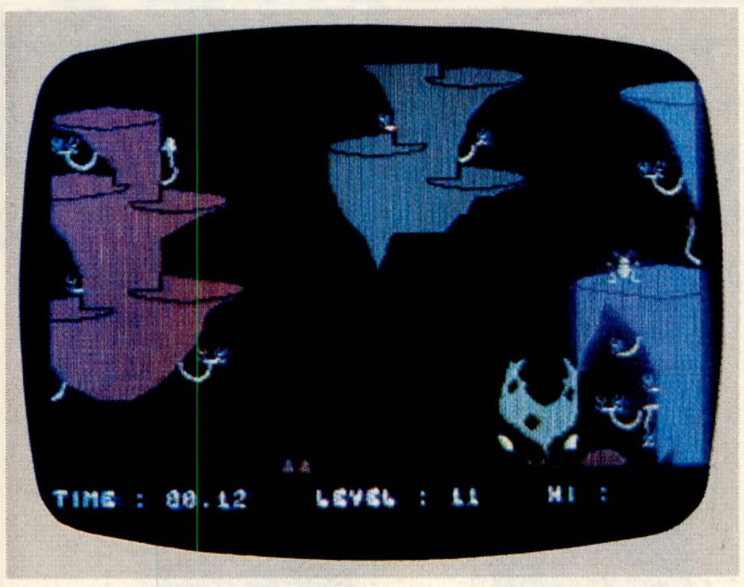


TANSOFT

SCREENPLAY



Test your rating in the hero stakes — save Commodore 64 fleas, repair brain-damaged galactic Spectrum robots and massacre rats in an Oric Atmos sewer. A challenging war game from Atari is also featured to provoke thought as well as action.



Boogaboo

Computer: Commodore 64 + joystick
Supplier: Quicksilva
Price: £7.95

Boogaboo is a flea who has fallen to the bottom of an alien cave and it's your job to save him. You must make him hop and jump up a series of ledges and out through the roof.

The object is to improve on the fastest time out of the cave — an almost impossible task. Perils lie in wait for our bite-sized hero in the shape of two hungry venus flytraps and one mean pterodactyl. Skilful control is essential since an incorrect leap will send Boogaboo plummeting back to the cave base or, even worse, into the mouth of the pterodactyl. Always look before leaping!

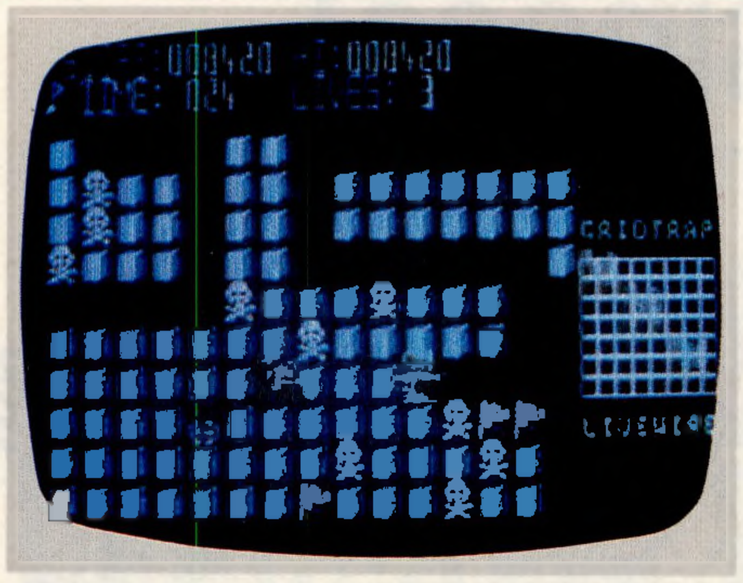
The length of jumps is controlled by pushing the joystick in the required direction and releasing it at the correct moment. This is judged by watching a series of dots that move across the bottom of the screen: the greater the number of dots, the longer the leap.

Computer game fanatics may have noticed a game called Bugaboo, also by Quicksilva but for the Spectrum. Although recommended, the new 64 version is so superior in graphics and playability that it's almost a different game.

One main criticism: the game takes over 15 seconds to start after it has loaded and since the tape has run out by then you are left looking at a blank screen convinced that it has failed to load. This could easily have been avoided by omitting the title sequence, which is mildly entertaining initially but slow and dull after a few plays.

A very addictive game. **TH**

Presentation 65%
Addictive quality 100%
Use of graphics 90%
Value for money 90%



Gridtrap

Computer: Commodore 64
Supplier: Sumlock Microware
Price: £8.95

You play the part of a character called LiveWire who has just 30 seconds to reach a bomb before it explodes.

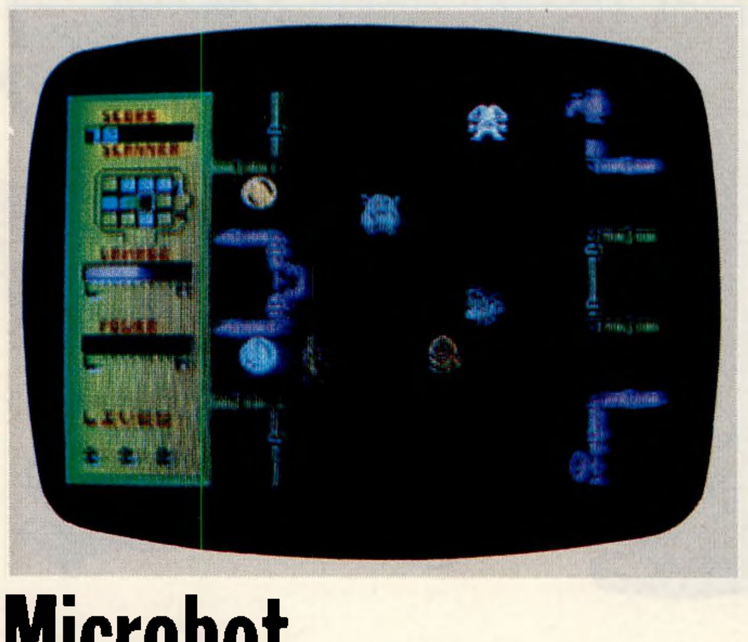
To add to the excitement and your problems, a second bomb appears when the count reaches 15 seconds and LiveWire has to move round a 15 x 10 grid in an effort to reach it.

You must be careful, for you can only step on each square of the grid once, after which it disappears. Some squares are impassable, being occupied by a skull and crossbones. There are also big boots which stomp around the grid in an attempt to squash you and generally give you a hard time. Initially, only one boot chases you — the other three are trapped in a cage on the left of the grid.

As you defuse bombs and proceed to more difficult playing levels extra boots and skulls come into play: the boots develop a strategy and work together to trap you.

Should you succumb to these various invitations to join the after-life, a Monty Pythonesque boot unceremoniously kicks you off the grid. Three such exits and the game is over. **TH**

Presentation 65%
Addictive quality 70%
Use of graphics 85%
Value for money 80%



Microbot

Computer: 48k Spectrum
Supplier: Softek
Price: £6.95

Microbot is the latest Spectrum offering from those awfully modest Softek people. They describe Microbot as 'probably the greatest, most addictive and original game you'll ever play for the Spectrum.'

You play the role of a galactic numbskull who has to repair brain-damage in the larger QT robots, inflicted by myriad bugs who chew holes in the life sustaining mezo-plasmic and lubrication pipes in the robots' brains.

The brain is divided into 12 areas each containing six pipes, three of each type. Damage is measured by the number of chewed pipes in each section and is colour-coded on a diagram to the left of the main screen.

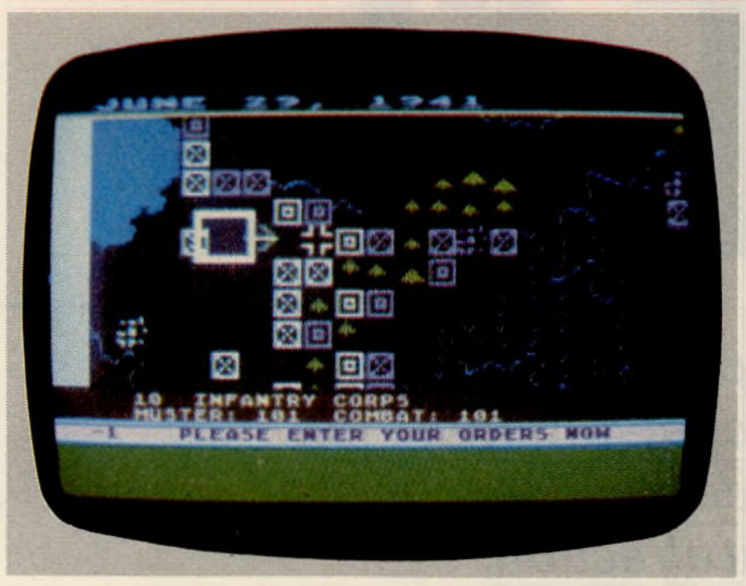
The game results in a race against time as you hurtle through sections of the brain destroying bugs and repairing pipes with your super fixative balls.

Skill is essental since you must avoid touching the bugs or allowing any brain section to become seriously damaged, or you'll lose one of your three lives.

If you reduce the amount of damage to less than 20% you are transported to another brain-damaged QT and your work continues.

As for being the most addictive and enjoyable game you'll ever play, it's not. **TH**

Presentation 60%
Addictive quality 70%
Use of graphics 70%
Value for money 75%



Eastern Front

Computer: Atari computers
Supplier: Atari
Price: £29.95

This is a challenging war game set on the Eastern Front in 1941: you are Germany in its abortive invasion of Russia. The computer plays the role of the Russians and is an able and devious opponent.

There are five levels of play ranging from beginner to expert. The beginner level allows you to familiarise yourself with the movements and strengths of your units. Once trained, you devise the strategy needed to defeat 119 units with only 47 of your own.

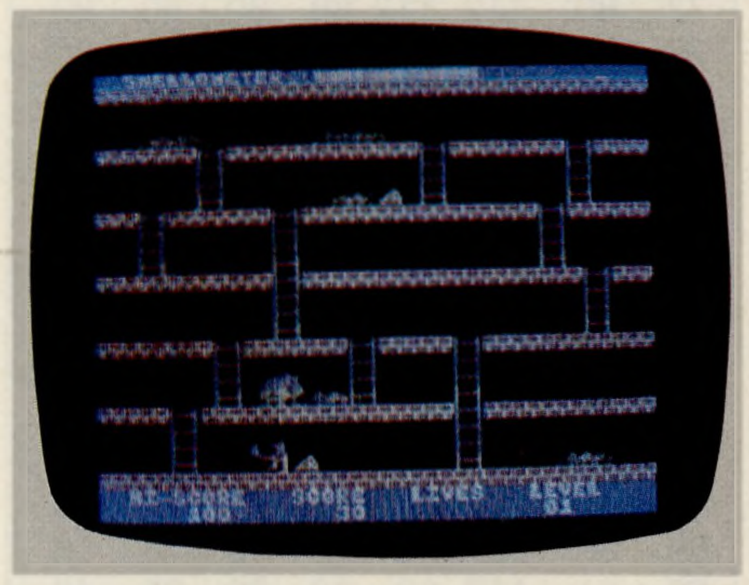
It's worth emphasising that this is a war game which concentrates on the tactics of war rather than killing — as in arcade games. In fact, the expert level contains a rather poignant anti-war message showing the absolute folly of the war on the Eastern Front. You are so outnumbered (and start with a minus score) that it's impossible to 'win'.

Each turn represents a week between June 1941 and March 1942 and takes several minutes to play. You must issue orders to your units by positioning a cursor over each one in turn and moving it in the desired direction. Once all your orders have been entered the computer executes your moves at the same time as its own.

In essence, Eastern Front is an excellent war game which simulates many real factors, such as the effects of the terrain on movement, weather conditions and troop morale.

Eastern Front will be hated by those who hate war games and liked by those who enjoy them. In effect, you replace an opponent who drinks your beer for one that eats your electricity. **TH**

Presentation 70%
Addictive quality 60%
Use of graphics 80%
Value for money 60%



Rat Splat

Computer: 48k Oric Atmos
Supplier: Tansoft
Price: £6.95

The first offering I have seen for the new Oric Atmos described as 'a game for all psychopathic rodent enthusiasts'. Down in the sewers live thousands of rats who simply adore cheese. The rat population has grown so large that a cull is organised, and your job is to carry out this gruesome task. Modern methods of extermination have no effect so you must kill as many rodents as possible by hitting them with your 'ACME Patent Rat Killing Hammer'.

The cheese strewn as bait around the sewer network is a particularly potent kind of Gorgonzola. It certainly attracts the rats but the stench is so overpowering that the fumes will kill you if you stay within range for too long. Then there's the rodents' friend — a monster that takes exception to your massacre of his furry chums and who comes looking for you. By pressing the relevant key, you may swap your rat-killing hammer for a monster-killing aerosol spray.

Tactics in this game involve rushing round the network of sewers and splatting the rats as they begin to nibble the cheese. Hitting a rat while it is eating will save the chunk of cheese for future use. As the avenging monster approaches, a quick key press gives you the aerosol spray, the fumes of which will do the trick. Don't forget to swap the aerosol back to a hammer in time for the next rat batch. You'll lose a life if the monster touches you, if you are over-powered by the smell of the cheese (the 'smellometer' at the top of the display warns you of this), or if the rats manage to eat all the lumps of cheese. Killing 15 rats enables you to move to the next level.

Presentation is very good, with a rat drawing on the loading screen and the option of selecting a quiet or noisy game. Instructions can be called up at any time and there is a Hall of Fame for the highest scores. Rat Splat is simple-to-play yet maddeningly addictive. **SM**

Presentation 80%
Use of graphics 70%
Addictive quality 75%
Value for money 75%



My Word

Computer: Commodore 64
Supplier: Papillon Software
Price: £9.95

In this digital version of a classic word game the players score in turn by adding letters to a growing word in the hope of completing it or blocking the following player. You can of course bluff but you can also be challenged, which is expensive since you lose all the points accumulated for letters in that word. Point value of the letters varies between two points for vowels and up to 15 points for the letters J, X, Q and Z.

Each player's 'think' time can be altered from a leisurely 99 seconds to a frantic five. Fifteen seconds is about right as it gives enough time to panic but not enough to go through all the possibilities that would produce a higher scoring word than you had originally planned.

Although the rules are simple, the game itself gets extraordinarily complicated as you attempt to conjure up words that you can complete which will gain you all the high-scoring letters. Obviously the other players in the 2-4 player option or the computer in the one player game have similar ideas. In one game, I planned the wonderfully high-scoring word (for me) 'photo-synthetic'. Imagine my anguish when it was rapidly transformed into 'photo-stat', leaving me speechless and wordless.

A pocket dictionary is included in this attractive package to help resolve any arguments over challenges. I recommend that you establish house rules to cover which words are excluded, such as plurals, slang words, names and abbreviations.

The only other criticism of an otherwise excellent game is that it lacks an ending: you have to establish your own, for example, the first to 200 points. **TH**

Presentation 90%
Addictive quality 70%
Use of graphics 60%
Value for money 80%

SPECTRUM

Wide Screen Editor

Word processing has not yet been successfully implemented on the Spectrum due to its restrictive 32-column display. Nicholas Ryman-Tubb has developed a program allowing 64 characters to be displayed from a Basic function call, which is a step in the right direction.

The Spectrum with its 32-column display, is probably the last computer you would use for a word processor. To get round the problem, here's a solution which allows you to display 64 characters per line from a simple function call in Basic. Text editor and character generator programs are also included.

Definition

Each Spectrum character normally occupies an 8×8 grid. This gives the total number of bits across the screen as 32×8=256. To get 64 characters across the screen, each character must occupy 256/64=4 bits, giving a definition for each character of 4×8. This is rather low, but sufficient to define the alphabet and most punctuation symbols.

As each character occupies four bits it only takes up half a byte: the example below is the character 'U'. A one bit gap has been left around the left hand side and bottom to make a clear display, so the real definition is only 3×7. The coding for this character is shown below:

```
BIN  01010000   =80
BIN  01010000   =80
BIN  01010000   =80
BIN  01010000   =80
BIN  01010000   =80
BIN  01010000   =80
BIN  01110000   =112
BIN  00000000   =0
```

You will see that bits 0,1,2,3 and 7 are always zero and the eighth row is always zero. Fig 1 contains codes for the full character set from space to Z (32-90) which can be entered using the program at Fig 2. The program in Fig 3 can be used to define and edit your own characters, and then saved onto tape. Once the program has been typed in, saved and run it will clear the screen and display an 8×8 grid of full stops. A cursor will be flashing in the top left hand square, and can be moved to cover any dot (each dot represents one pixel) by using the arrow keys SHIFT+5 LEFT, SHIFT+6 DOWN, SHIFT+7 UP, SHIFT+8 RIGHT.

Once the cursor is over the square a block can be created or deleted by using the ENTER or DELETE keys. The cursor is moved off that square to the next one, and so on. To move onto the next character type 'n' and it will be displayed. To save all the created/edited characters type 's'.

As an example: when the program is run, answer the question 'ADDRESS?' with 'USR ""a"'. The program will display the first user-definable graphic character which can then be edited: move onto the next by typing 'n'. Display the created characters by going into graphics mode (SHIFT+9) and typing 'abcde . . .' To create your own character set for use with a wide screen program answer the question 'ADDRESS?' with 65000.

32	0	0	0	0	0	0	0
33	32	32	32	32	32	0	32
34	0	80	80	0	0	0	0
35	0	80	112	80	112	80	0
36	32	112	96	32	48	112	32
37	16	48	32	32	32	96	32
38	112	80	96	64	112	48	80
39	0	32	32	0	0	0	0
40	16	32	64	64	64	32	16
41	64	32	16	16	16	32	64
42	0	80	32	112	32	80	0
43	0	32	32	112	32	32	0
44	0	0	0	48	48	16	16
45	0	0	0	112	0	0	0
46	0	0	0	0	0	0	16
47	0	16	32	32	32	32	64
48	112	80	80	80	80	80	112
49	32	96	32	32	32	32	32
50	112	16	16	32	64	64	112
51	112	80	16	112	16	80	112
52	16	48	80	80	112	16	16
53	112	64	64	32	16	16	96
54	96	64	64	96	80	80	96
55	112	80	16	16	16	16	16
56	112	80	80	112	80	80	112
57	112	80	80	112	16	16	112
58	0	0	0	0	32	0	0
59	0	0	0	32	0	32	64
60	0	16	32	64	32	16	0
61	0	0	112	0	112	0	0
62	0	64	32	16	32	64	0
63	112	80	16	32	32	0	32
64	112	80	96	80	80	80	112
65	32	80	80	112	80	80	80
66	112	80	96	80	80	80	112
67	112	80	64	64	64	80	112
68	96	80	80	80	80	80	96
69	112	64	64	112	64	64	112
70	112	64	112	64	64	64	64
71	112	64	64	64	80	80	112
72	80	80	80	112	80	80	80
73	112	32	32	32	32	32	112
74	112	32	32	32	32	32	96
75	80	80	96	96	80	80	80
76	64	64	64	64	64	64	112
77	80	112	112	80	80	80	80
78	80	112	112	112	112	80	80
79	32	80	80	80	80	80	32
80	32	80	80	112	64	64	64
81	32	80	80	80	112	80	32
82	96	80	112	96	80	80	80
83	112	64	64	112	16	16	112
84	112	32	32	32	32	32	32
85	80	80	80	80	80	80	112
86	80	80	80	80	80	112	32
87	80	80	80	80	112	112	80
88	80	80	32	32	32	80	80
89	80	80	48	16	16	16	16
90	0	112	16	16	32	32	48

Fig 1 Character codes

```
10   REM ************************
20   REM *Character Data Set-Up*
30   REM *Program for TXED      *
40   REM *(C)Tubb Research, 1984*
50   REM ************************
60   LET add=65000
70   LET code=32
80   CLS
90   PRINT AT 0,0;
     "Date for character:";code
91   PRINT AT 1,0;"Character:"
92   PRINT AT 15,0;"Row:"
95   FOR i=0 TO 7: POKE
     (USR "u"+i),0: NEXT I
100  FOR i=0 TO 6
101  PRINT AT 15,6;i
110  INPUT "Data?";j
120  POKE (add+i),j
130  POKE (USR "u"+i),J
131  PRINT AT 1,11;""""
140  NEXT i
150  POKE (add+7),0
160  LET add=add+8
170  LET code=code+1
180  GO TO 80
```

Fig 2 Character data set-up program

Passing values

Passing values to a machine code routine is not catered for in ZX Basic, but if a function is defined as calling that

```
2     REM************************
3     REM*USER-DEFINED GRAPHICS*
4     REM*        GENERATOR
5     REM*For use with the WIDE*
6     REM*SCREEN program or any*
7     REM*other.
8     REM*(C)Tubb Research, 1984*
9     REM************************
10    CLS
11    LET co=0
20    PRINT AT 0,5;"CHARACTER GENERATOR"
30    INPUT "Address?";a
32    IF a=0 THEN LET a=15616
33    LET top=a
34    REM**********************
35    REM* Display the grid *
36    REM**********************
40    FOR y=1 TO 8
50    FOR x=1 TO 8
60    PRINT AT y+5,x+10;"."
70    NEXT x: NEXT y
80    LET co=co+1
90    REM********************
100   REM*Display the bits*
102   REM********************
115   FOR y=1 TO 8
116   LET p=PEEK a
117   PRINT AT y+5,3;p;""
118   LET a=a+1
120   FOR x=8 TO 1 STEP -1
130   LET p=p/2
140   IF p<>INT p THEN PRINT AT y+5,x+10;"*"
150   LET p=INT p
160   NEXT x
170   NEXT y
190   REM************
200   REM*Get input*
205   REM************
210   LET x=1: LET y=1
220   PRINT INVERSE 1; OVER 1; FLASH 1; AT y+5,x+10;"*"
230   PAUSE 4e4: LET s=CODE (INKEY$)
231   PRINT AT 10,20;"
232   PRINT OVER 1; INVERSE 0; AT y+5,x+10;""
235   REM************************
236   REM*ENTER =Enter block      *
237   REM*DELETE=Delete block     *
238   REM*s      =Save onto tape*
239   REM*n      =Next character*
240   REM************************
242   IF s=13 THEN GO TO 1000
250   IF s=12 THEN GO TO 2000
252   IF s=110 THEN GO TO 40
254   IF s=115 THEN GO TO 3000
260   IF s=8 THEN LET x=x-1
270   IF s=10 THEN LET y=y+1
280   IF s=11 THEN LET y=y-1
290   IF s=9 THEN LET x=x+1
295   REM********************
300   REM*Check the bounds*
302   REM********************
310   IF x<1 THEN LET x=8
320   IF x>8 THEN LET x=1
330   IF y<1 THEN LET y=8
340   IF y>8 THEN LET Y=1
350   GO TO 220
990   REM****************
999   REM**ENTER BLOCK**
1000  REM****************
1001  LET k=0
1005  LET t=a
1010  LET a=a-8+y-1
1020  REM a=row address
1030  LET k=2^(8-x)
1032  LET k=k+PEEK a
1033  IF K>255 THEN PRINT AT 10,20;"ERROR": GO TO 1082
1034  PRINT AT 10,20;"ENTER"
1035  POKE a,k
1080  PRINT AT y+5,x+10;"*"
1081  PRINT AT y+5,3;K;""
1082  LET a=t
1083  LET k=0
1090  GO TO 220
1094  REM******************
1095  REM**REMOVE BLOCK**
2000  REM******************
2010  LET t=a
2020  LET a=a-8+y-1
2030  LET k=2^(8-x)
2040  LET k=(PEEK a)-k
2041  IF k<>ABS k then PRINT AT 10,20;"ERROR":
      GO TO 1082
2045  PRINT AT 10,20;"DELETE"
2050  POKE a,k
2060  LET a=t
2070  PRINT OVER 0;AT y+5,x+10;"."
2071  PRINT AT y+5,3;k;""
2080  GO TO 220
2090  REM******************
2095  REM**SAVE THE CODE**
3000  REM******************
3010  CLS
3020  PRINT "FROM:";top
3030  PRINT "TO:";top+(8*co)+8
3040  PRINT "FOR:";co*8+8
3050  INPUT "File name?";n$
3060  SAVE n$CODE top,(co*8)+8
3070  PRINT "END": STOP
```

Fig 3 User-defined graphics generator

Note. The '' in lines 140, 220 & 1080 is used to represent the graphic character obtained by entering the graphic mode (SHIFT+9) and pushing SHIFT+8; a black square should appear.*

routine its arguments can be accessed by the sample routine in Fig 4. If the function 's' if defined as DEF FNs(x,y,z)=USR 65000 and called by RANDOMIZE FNs(5,3,99), the machine code routine in Fig 4 will have the arguments passed to it as A=5, B=3, C=99. Values can be passed to machine code routines in this way. The program in Fig 5 requires three input parameters: the x,y coordinates of the character to be printed and the character code c. The function is defined as DEF FN(x,y,c) = USR 59000 Range: X=0–63 Y=0–24 C=Character code (32-90)

```
65000   LD      IX,(23563)      ; IX points to the argument list
        LD      A,(IX+4)        ; A=First argument (8-bit)
        LD      B,(IX+12)       ; B=Second argument (8-bit)
        LD      C,(IX+20)       ; C=Third argument (8-bit)
                .               ; For as many arguments as you like
                .               ; (Arguments could be stacked)
```

Fig 4 Passing values sample routine

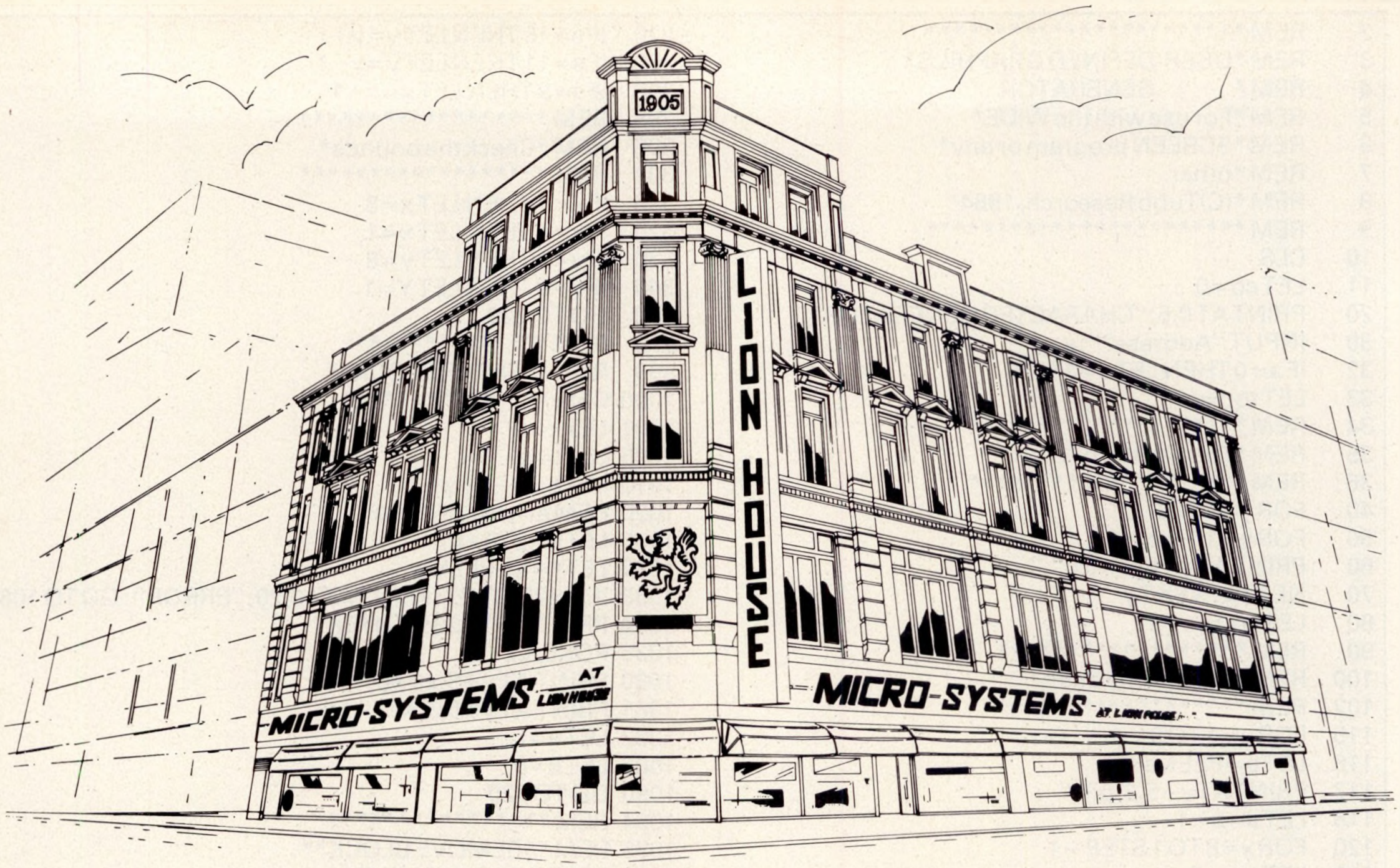
Implementation

As the Spectrum's screen memory is laid out in a relatively unusual way, a method of calculating the screen address is needed.

The routine at 3739 in the Sinclair ROM calculates the screen address of the start of the line. It assumes register B=the line number (screen). If B is loaded with the Y coordinate and this routine is called it will return with HL pointing to the address of the start of that line. When the X coordinate is called we have the screen address to print to.

The character code is given in register HL. This is multiplied by eight (number of bits per character) and added onto the table start address (held in register BC).

As soon as the screen position and start address of the character bit pattern



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are known, it is not too difficult to print the character. Check to see which side of the character it is printing: if the right hand side of the character is being printed (that is, x is odd), then the character bit pattern must be rotated so that it is in bits 0,1,2 and 3 rather than

```
        ORG     59000
CHARS:  EQU     23606
FLAGS:  EQU     23611

        LD      IX,(23643)      ;IX=Argumentlist
        LD      B,(IX+12)       ;B=Ycoordinate
        CALL    3739            ;HL=Startofline
        LD      A,(IX+4)        ;A=Xcoordinate
        SRL     A               ;Checkwhichhalfofsquare
        JR      NC,LEFT         ;Mustbethaleftside
        PUSH    AF
        LD      A,255           ;Setupthefllag
        LD      (SIDE),A
        POP     AF
        JR      PROC            ;Gotothemainroutine
LEFT:   PUSH    AF
        XOR     A               ;Setupthefllagtozero
        LD      (SIDE),A
        POP     AF
PROC:   LD      D,0             ;DE=Xaddress
        LD      E,A
        ADD     HL,DE           ;HL=Screenaddresstoprintto
        LD      A,(IX+20)       ;A=Charactertoprint
        CP      128             ;CheckforASCIIrange
        RET     NC              ;Exitifnot
        PUSH    BC
        LD      BC,65000-256    ;BC=Startofcharacterlist
        EX      DE,HL           ;DE=Screenaddress
        SUB     32              ;Startatspace
        LD      H,0
        LD      L,A             ;HL=Offsetintothetable
        ADD     HL,HL
        ADD     HL,HL
        ADD     HL,HL
        ADD     HL,BC           ;HL=ASCII*8+Startaddress
        POP     BC
        EX      DE,HL
        PUSH    BC
        PUSH    HL
        LD      A,8             ;A=Numberofcolumns
        AND     A
        EX      DE,HL
AGAIN:  EX      AF,AF
        LD      A,(SIDE)        ;Checktoseewhichside
        OR      A
        JR      Z,LHS           ;Ifzerothenmustbeleft
        LD      A,(HL)          ;Getbitpattern
        RRA
        RRA
        RRA
        RRA                     ;Shifttotheleft
        LD      (HL),A
LHS:    LD      A,(DE)          ;Fromscreen
        XOR     (HL)            ;Putinthenew
        LD      (DE),A          ;Writeit
        LD      A,(SIDE)
        OR      A
        JR      Z,LEAVE         ;Checksideagain
        LD      A,(HL)          ;Putitback!
        RLA
        RLA
        RLA
        RLA
        LD      (HL),A
LEAVE:  EX      AF,AF
        INC     D               ;Nextrowdown=de+100H
MORE:   INC     HL              ;Nextcolumnintable
        DEC     A               ;Counter
        JR      NZ,AGAIN
        EX DE,HL
        DEC     H               ;HL=-100H
        CALL    3035            ;Updatescreenattributes
        POP     HL
        POP     BC
        DEC     C               ;Nextscreenposition
        RET
SIDE:   DEFB 0
ADDR:   DEFB 255
        END
```

Fig 5 Z80 mnemonics

4,5,6 and 7. Once this has been done the bit pattern is printed over what is already at that position (PRINT OVER 1). The program then loops round eight times, printing each row of the character. Finally, it updates the screen attributes. Fig 5 shows the Z80 mnemonics.

The program given in Fig 6, written in Basic, shows how the characters are printed *row* by *row* (this is a Basic version of the Sinclair ROM routine at OB65H).

A simple text editor program written in Basic demonstrates the wide screen routine. The program allows upper case only to be displayed anywhere on the screen. The 'arrow' keys can be used to move the cursor and return to the start of the next line. No delete function is included but this can be done by moving the cursor over the character you wish to remove and retyping that same character (the machine code routine uses XOR). Once the program is run it expects the special characters to be next on the tape, saved by the definition program. These are loaded and the text editor displays a welcome message. The screen can be printed by breaking out of the program and typing COPY. The screen is then dumped to the ZX printer. **END**

```
1   REM**a=screen address**
5   LET a=18432
10  REM**b=Address of the
    character set**
20  LET B=(PEEK 23606
    +256*PEEK 23607)+256
30  REM**Loop for all 90
    characters**
40  FORg=b to b+(8*90) STEP 8
45  REM**Loop for 8 rows**
46  FOR I=0 TO 7
50  REM**Write in each row**
60  POKE (a+(256*i)),(PEEK(g+))
70  PAUSE 4
80  NEXT 1
90  LET a=a+1
100 NEXT g
```

Fig 6 Row by row characters

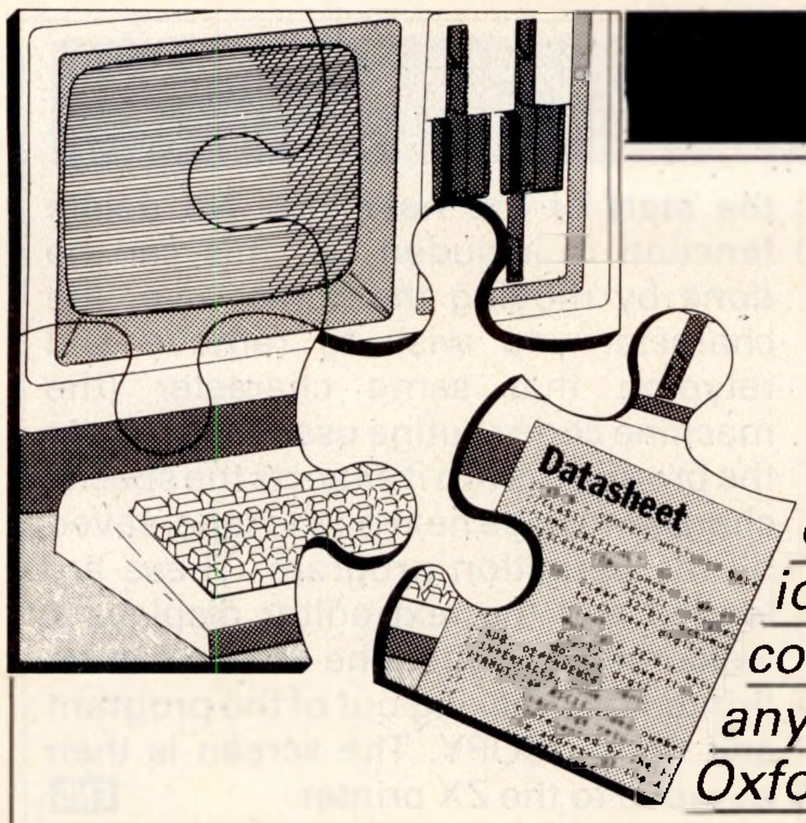
```
**********************************
*   SPECTRUM WIDE SCREEN         *
*   TEXT EDITOR TEST             *
*   PROGRAM                      *
*   (C) Tubb Research            *
**********************************

1   REM
2   REM
3   REM
4   REM
5   REM
6   REM
7   REM
8   REM---Get the characters
9   CLEAR 50000: GO SUB 370
10  PRINT "LOADING CHARACTERS"
11  PRINT FLASH 1; INVERSE 1;
    "PLEASE LEAVE TAPE RUNNING"
12  LOAD "CHAR64" CODE 65000
20  CLS
30  DEF FN a(x,y,c)=USR 59000
31  REM **********************
32  REM * PRINT THE TITLE *
33  REM **********************
40  LET a$="64 SCREEN TEST
    PROGRAM!"
50  LET y=24
60  LET x1=16
70  GO SUB 310
80  LET y=23: LET x1=16: LET
    a$="================:
90  GOSUB 310
100 LET a$="ENTER TEXT HERE:"
100 LET y=22: LET x1=0
120 GOSUB 310
121 REM **********************
122 REM * SET UP THE CURSOR **
123 REM **********************
130 LET x1=: LET y=21
140 RANDOMIZE FN a(x1,y,42)
141 REM ******************
142 REM * GET A KEY **
143 REM ******************
150 LET b$=INKEY$: IF b$=
    "" THEN GOTO 150
160 BEEP .08,20: RANDOMIZE
    FN a(x1,y,42)
170 LET b=CODE b$
171 REM ******************
172 REM * CHECK FOR CURSOR *
173 REM * MOVEMENT KEYS *
174 REM ******************
180 IF b=8 THEN LET x=x1-1
190 IF b=10 THEN LET y=y-1
200 IF b=11 THEN LET y=y+1
210 IF b=9 THEN LET x1=x1+1
220 IF b=13 THEN LET y=y-1
    : LET x1=0

221 REM ******************
222 REM *CHECK IF OUT OF *
223 REM *SCREEN *
224 REM ******************
240 IF y>24 THEN LET y=1
250 IF y<1 THEN LET y=24
260 IF b<32 THEN GO TO 140
270 IF b>90 THEN STOP
280 RANDOMIZE FN a(x1,y,(CODE b$))
290 LET x1=x1+1
300 GO TO 140
301 REM ******************
302 REM *PRINTING MESSAGE *
303 REM *Routine *
304 REM ******************
310 FOR i=1 TO LEN a$
320 LET c=CODE (a$(i TO i))
330 LET x=x1+i
340 RANDOMIZE FN a(x,y,c)
350 NEXT i
360 RETURN
361 REM ******************
362 REM ** LOADING M/C **
364 REM ******************
370 FOR i=0 TO 112
380 READ h: POKE (59000+i),h
391 REM ******************
392 REM *THE MACHINE CODE *
393 REM ******************
400 DATA 221,42,11,92,221,70,12,205
410 DATA 155,14,221,126,4,203,63,48
420 DATA 9,245,62,255,50,227,230,241
430 DATA 24,6,245,175,50,227,230,241
440 DATA 22,0,95,25,221,126,20,254
450 DATA 120,200,197,1,202,253,235,214
460 DATA 32,38,0,111,41,41,41,9
470 DATA 193,235,197,229,62,8,167,235
480 DATA 8,58,227,230,183,40,6,126
490 DATA 31,31,31,31,119,26,174,18
500 DATA 58,227,230,183,40,6,126,23
510 DATA 23,23,119,8,35,6
520 DATA 32,222,235,37,205,219,11
525 DATA 225,193,13,201,0,255,0,0,0,0
530 RETURN
```

Fig 7 TXED listing

SUBSET



This is your chance to help build a library of general-purpose routines, documented to the standards developed by Alan Tootill and David Barrow in this series. The documentation enables you to use the routines, even if you don't understand the code. 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 SubSet,* PCW, *62 Oxford Street, London W1A 2HG.*

2040-BIT CONVERSION

LNGIBD is part of a 'family' of large number routines with a consistent interfacing protocol written by Andrew Stephenson of High Wycombe. The 'LNGxxx' family includes 'clear', 'copy', 'add', 'subtract', 'multiply', 'ASCII decimal to binary' and 'binary to ASCII decimal' — LNGIBD.

The action of LNGIBD is interesting. Instead of left-shifting the binary value to get the next bit — as most conversion routines do — it sets up a bit mask. The mask is rotated right every iteration to cover the next bit for processing. When it wraps around to cover bit 7, the next byte down is indexed. The entire binary value is processed bit by bit, without being disturbed — a far quicker method than a 255-byte shift.

The conversion is done in two stages. The first stage produces an intermediate result which is *unpacked* BCD — one decimal digit per byte — stored 'lo-digit-lo-address'. This is the normal order of storing binary values in the 8080/Z80 processor family. In the second stage, the order of the digits is reversed and, at the same time, the ASCII hi-nibble for decimal digits is added. The end result is a normally ordered ASCII string.

LNGIBD is written to convert to ASCII decimal but will convert to any base 2 to 10 by changing the variable 'BASE'. It can be altered to convert to any base 2 to 36 (using letters up to Z for these new digits) by substituting CALL BASASC for each of the occurrences of OR 30H at eight and five lines from the end. BASASC is an 8-byte subroutine tacked onto the end.

```
BASASC: ADD A,30H ;add ASCII decimal high      C6 30
        CP  3AH   ;nibble and test if 0 to 9,  FE 3A
        RET C     ;exiting if ok, else         D8
        ADD A,7   ;step up to ASCII letters    C6 07
        RET       ;and exit                    C9
```

Andrew's interfacing protocol does not include returning the addresses in the registers used for input. HL and DE both point to the middle of the ASCII string on exit so you will need to save the addresses used before calling LNGIBD.

DATASHEET

```
;= LNGIBD - Long Integer Binary to Decimal conversion.
;/ CLASS:  2 (registers not saved, direct addressing used).
;/ TIME CRITICAL:  No.
;/ DESCRIPTION:  Converts a binary integer, stored lo-byte-
;/               lo-address to ASCII decimal string stored
;/               hi-digit-lo-address in different storage area.
;/ ACTION:   IF value = 0 THEN write '0' and end.
;/             ELSE index most significant bit of MSByte
;/               FOR each bit of binary value
;/                 Set Carry if bit set
;/                 FOR each digit of intermediate result
;/                   Double digit adding in Carry
;/                   IF digit < 10 THEN clear Carry
;/                   ELSE subtract 10 and set Carry
;/                 NEXT digit
;/                 IF overflow from partial result THEN form
;/                   new high order digit = 1
;/               NEXT bit
;/               Reverse digit sequence, add ASCII hi-nibbles.
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES:  Binary value in RAM or ROM.
;/              Output area in RAM. 2-byte storage in RAM.
;/ INPUT:    BVAL = address of 1st byte of binary value.
;/           DVAL = address of 1st byte of output area
;/           (output area = 2.42 * binary byte length + 1)
;/           HL = BVAL, DE = DVAL, A = binary byte length (1 to 255)
;/ OUTPUT:   ASCII decimal string at DVAL with null terminator (0)
;/ REGs USED:  AF BC DE HL
;/ STACK USE:  2
;/ LENGTH:  code: 114   temporary storage: 2
;/ PROCESSOR:  8080/8085/Z80
!
BASE    EQU  10          ;conversion base (decimal)
VPTR:   DEFW 0           ;temporary storage space.        00 00
LNGIBD: LD   C,A         ;byte length as 16-bit value     4F
        LD   B,0         ;in BC for adding to pointer.    06 00
        DEC  HL          ;BVAL - 1 for indexing and       2B
        LD   (VPTR),HL   ;save for use in main loop.      22 YY YY
        LD   A,0FFH      ;mark temporary end of           3E FF
        LD   (DE),A      ;decimal output area.            12
;find most significant byte. Else deal with zero value.
        ADD  HL,BC       ;index binary highest byte.      09
NXTMSB: LD   A,(HL)      ;loop: get byte and test for     7E
        OR   A           ;zero, exit loop when            B7
        JP   NZ,MSBFND   ;MSByte found, with C as         C2 YY YY
        DEC  HL          ;no. of significant bytes        2B
        DEC  C           ;and HL pointer to hi-byte,      0D
        JP   NZ,NXTMSB   ;or all bytes zero so            C2 YY YY
        EX   DE,HL       ;index DVAL and put              EB
        LD   (HL),'0'    ;default ASCII 0                 36 30
        INC  HL          ;followed by                     23
        LD   (HL),0      ;null terminator                 36 00
        RET              ;then exit.                      C9
;find most significant bit, initialise bit-select mask.
MSBFND: LD   B,A         ;MSByte to B for comparison.     47
        LD   A,80H       ;start bitmask.                  3E 80
NXTMSK: CP   B           ;loop: shift bit down            B8
        JP   C,MSKFND    ;until in same place             DA YY YY
        JP   Z,MSKFND    ;as highest set bit in           CA YY YY
        RRCA             ;MSByte, covering most           0F
        JP   NXTMSK      ;significant bit.                C3 YY YY
;main loop. Get next bit into intermediate decimal result.
MSKFND: LD   B,A         ;B = bitmask, C = byte index     47
        PUSH BC          ;save both on stack.             C5
        LD   HL,(VPTR)   ;get BVAL - 1 and add            2A YY YY
        LD   B,0         ;current byte index to           06 00
        ADD  HL,BC       ;address current byte.           09
        AND  (HL)        ;get current bit, masking out    A6
        ADD  A,0FFH      ;others, propogate to Carry.     C6 FF
;partial result * 2 + current bit. Adjust each byte using
;Couleur's criterion to one BCD digit per byte.
        LD   L,E         ;move DVAL to HL.                6B
        LD   H,D         ;                                62
NXTOPV: LD   A,(HL)      ;loop: get intermediate          7E
        INC  A           ;result byte, test for end       3C
        JP   Z,OPVDON    ;mark (0FFH), exit if found      CA YY YY
```

```
        DEC  A          ;else correct back and double   3D
        ADC  A,A        ;it, adding in current bit.     8F
        CP   BASE       ;skip if digit is valid         FE 0A
        JP   C,NOCOUL   ;else make it valid and have    DA YY YY
        SUB  BASE       ;a carry over to next digit.    D6 0A
NOCOUL: CCF             ;correct state of Carry.        3F
        LD   (HL),A     ;store digit and repeat until   77
        INC  HL         ;end of current partial         23
        JP   NXTOPV     ;result reached.                C3 YY YY
OPVDON: JP   NC,NXTDON  ;skip if no result overflow     D2 YY YY
        LD   (HL),1     ;else new high digit can        36 01
        INC  HL         ;only be 1. Point to next       23
        LD   (HL),0FFH  ;byte and put new end mark.     36 FF
;rotate bitmask to cover next bit, next byte if necessary.
NXTDON: POP  BC         ;restore mask and byte index    C1
        LD   A,B        ;move mask to A and shift set   78
        RRCA            ;bit down. If not in bit 7      0F
        JP   NC,MSKFND  ;then loop for next bit         D2 YY YY
        DEC  C          ;else index next byte and       0D
        JP   NZ,MSKFND  ;loop if not finished.          C2 YY YY
;reverse digit order and add ASCII digit hi-nibbles.
        LD   (HL),0     ;terminator replaces end mark.  36 00
NXTCNV: DEC  HL         ;decrement high pointer and     2B
        LD   A,L        ;test if hi-pointer and         7D
        SUB  E          ;lo-pointer have passed each    93
        LD   A,H        ;other yet, setting Carry if    7C
        SBC  A,D        ;they have, exit conversion     9A
        RET  C          ;complete if they have.         D8
        LD   A,(DE)     ;else pick up lower digit       1A
        OR   30H        ;convert it to ASCII and        F6 30
        LD   B,A        ;save in B while                47
        LD   A,(HL)     ;getting higher digit           7E
        OR   30H        ;converted to ASCII.            F6 30
        LD   (HL),B     ;replace ASCII digits in        70
        LD   (DE),A     ;reverse order.                 12
        INC  DE         ;move lower pointer up 1        13
        JP   NXTCNV     ;and repeat until all done.     C3 YY YY
```

6809 RANDOM NUMBERS

A perennially recurring subject is that of pseudo-random numbers.

The conclusion drawn in Sub Set was that a 16-bit generator based on the algorithm, or series $R_{i+1} = (1509R_i + 41) \bmod 2^{16}$ and a 32-bit generator based on $R_{i+1} = (69069_i + 41) \bmod 2^{32}$ would produce sequences that ought to satisfy all but the absolute perfectionist.

Z80 implementations of these generators, by Kevin Smith and John Kerr, were published in Sub Set, February 1983. RAND16 and RAND32 are versions written for the 6809 by Dr Paul Beale of the Department of Theoretical Physics, Oxford University.

DATASHEET

```
;= RAND16 - 16-bit pseudo-random number generator.
;/ CLASS:  1.
;/ TIME CRITICAL:  No.
;/ DESCRIPTION:  Generates a 16-bit number from the series
;/               R = (1509 * R + 41) mod 2**16
;/ ACTION:   1509 = 5 * 256 + 229
;/           R-temp := (41 + 229 * R) mod 2**16
;/           R := (R-temp + 5 * 256 * R) mod 2**16
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES:  Stack RAM.
;/ INPUT:    Seed or previous random number in user stack
;/           U:U+1 = RAND.
;/ OUTPUT:   New RAND in U:U+1.
;/ REGs USED:  U.
;/ STACK USE: Hardware stack (S): 3.  User stack (U): 2.
;/ LENGTH:   37.
;/ TIME STATES:  116.
;/ PROCESSOR:  6809.

RAND16: PSHS A,B,CC     ;save registers and flags.      34 07
        LDA  1,U        ;get RAND low order byte,       A6 41
        LDB  #$E5       ;multiply it by 229             C6 E5
        MUL             ;and                            3D
        ADDD #$29       ;add 41 and store in user       C3 00 29
        STD  ,--U       ;stack as accumulator.          ED C3
        LDA  2,U        ;multiply RAND high order       A6 42
        LDB  #$E5       ;byte by 229, add product       C6 E5
        MUL             ;to high byte                   3D
        ADDB ,U         ;of accumulator.                EB C4
        STB  ,U         ;'R-temp' now complete.         E7 C4
        LDA  3,U        ;get RAND low order byte,       A6 43
        LDB  #5         ;multiply it by 5, add it       C6 05
        MUL             ;not to 'R-temp' lo-byte but    3D
        ADDB ,U         ;to 'R-temp' hi-byte for        EB C4
        STB  ,U         ;'* 256' by single byte shift.  E7 C4
        LDD  ,U++       ;replace old RAND by new        EC C1
        STD  ,U         ;RAND, correcting user stack.   ED C4
        PULS A,B,CC     ;restore registers from         35 07
        RTS             ;system stack and return.       39
```

DATASHEET

```
;= RAND32 - 32-bit pseudo-random number generator.
;/ CLASS:  1.
;/ TIME CRITICAL:  No.
;/ DESCRIPTION:  Generates a 32-bit number from the series
;/               R = (69069 * R + 41) mod 2**32
;/ ACTION:   69069 = 65536 + 13 * 256 + 205
;/           R-temp := (41 + 205 * R + 13 * 256 * R) mod 2**32
;/           R := (R-temp + 65536 * R) mod 2**32
;/ SUBr DEPENDENCE:  None.
;/ INTERFACES:  Stack RAM.
;/ INPUT:    Seed or previous random number in user stack
;/           U:U+1:U+2:U+3 = RAND.
;/ OUTPUT:   New RAND in U:U+1:U+2:U+3.
;/ REGs USED:  U.
;/ STACK USE: Hardware stack (S): 7.  User stack (U): 5.
;/ LENGTH:  59.
;/ TIME STATES:  322.
;/ PROCESSOR:  6809.

RAND32: PSHS A,B,X,Y,CC ;save registers and flags.      34 37
        CLR  -3,U       ;clear part of accumulator at   6F 5D
        CLR  -4,U       ;U-5 to U-1 and initially       6F 5C
        LEAX -2,U       ;index it by X at low 2-bytes.  30 5E
        LDA  5,X        ;get RAND lowest byte,          A6 05
        LDB  #$CD       ;multiply it by 205             C6 CD
        MUL             ;and                            3D
        ADDD #$29       ;add 41 and store in low        C3 00 29
        STD  ,X         ;2-bytes of accumulator.        ED 84
        LDY  #3         ;count 3 remaining bytes.       10 8E0003
LOOP:   LEAX -1,X       ;address next byte.             30 1F
        LDA  5,X        ;multiply RAND current byte     A6 05
        LDB  #$CD       ;by 205 and add to              C6 CD
        MUL             ;correct position in            3D
        ADDD ,X         ;accumulator.                   E3 84
        STD  ,X         ;                               ED 84
        LDA  6,X        ;multiply next lower byte by    A6 06
        LDB  #$0D       ;13 and add to accumulator      C6 0D
        MUL             ;at one byte higher up for      3D
        ADDD ,X         ;'* 256' by single byte shift.  E3 84
        STD  ,X         ;                               ED 84
        LEAY -1,Y       ;on exit from loop              31 3F
        BNE  LOOP       ;'R-temp' is complete.          26 E8
        LDD  2,U        ;'* 65536' done by double       EC 42
        ADDD -4,U       ;byte shift, add to 'R-temp'    E3 5C
        STD  ,U         ;replace old RAND               ED C4
        LDD  -2,U       ;by new RAND from               EC 5E
        STD  2,U        ;accumulator.                   ED 42
        PULS A,B,X,Y,CC ;restore registers from         35 37
        RTS             ;system stack and return.       39
```

The Flagship...

In keeping with a long tradition of producing fine quality dot matrix printers, Epson have now launched their new flagship. The LQ-1500 is a new breed of printer, that will give you the best of both worlds. A dot matrix printer, although capable of 200 CPS in draft mode, can be set to produce letter quality at 66 CPS by simply flicking a switch.

Like all Epson products, versatility has been a primary consideration of the LQ-1500, incorporating friction feed as standard with optional tractor and hopper feed and a carriage width of a full 15".

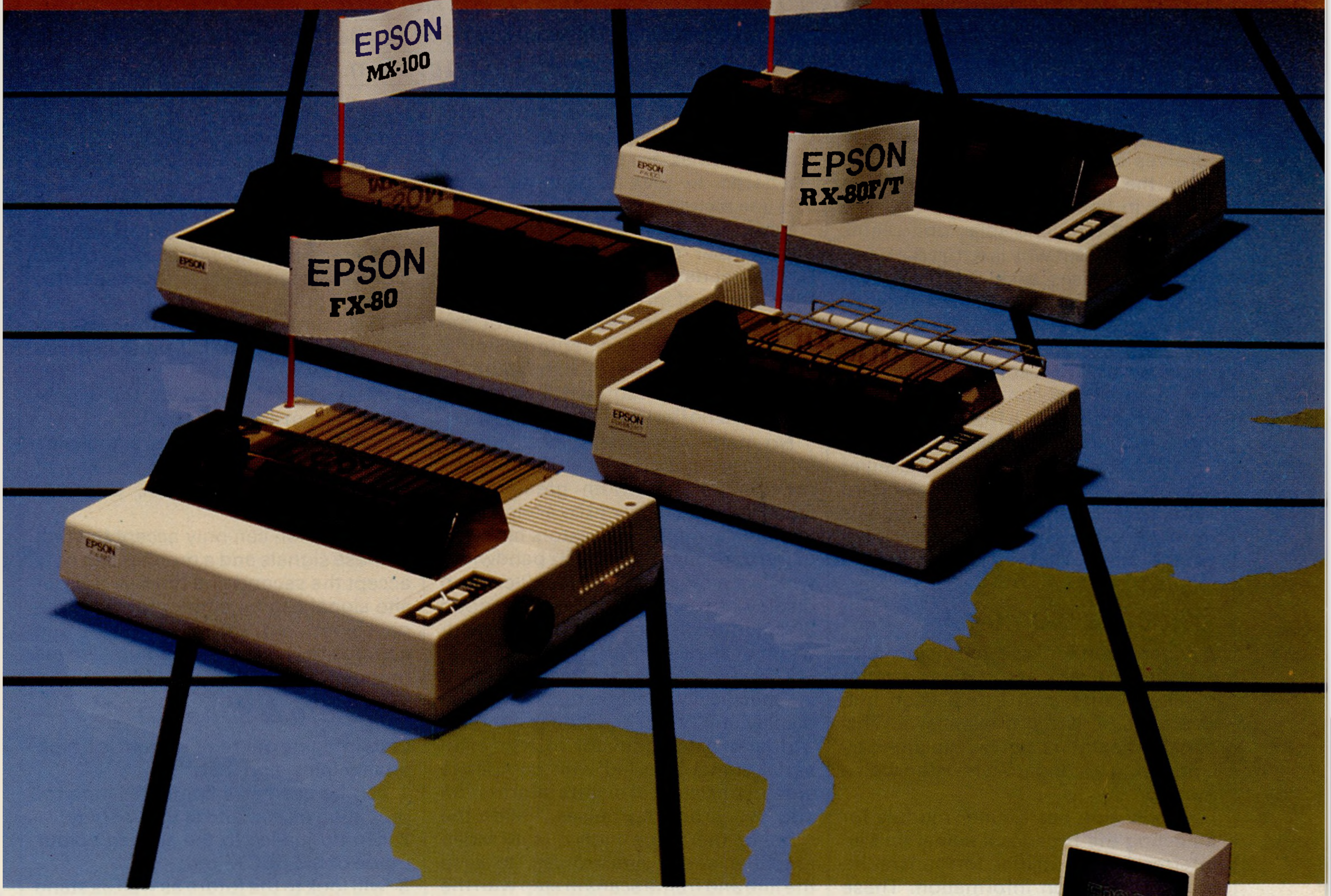
You now have at your fingertips all the advantages of a daisywheel machine, in terms of quality, together with the added benefits of condensed or enlarged characters and proportional spacing, plus very high speed when set to operate in draft form.

Having superb graphics capabilities and optional 8-bit parallel (Centronics) RS 232 and 1EEE interfaces, the LQ-1500 has taken its rightful place at the head of the Epson fleet of fine dot matrix printers.

Epson have been leading the field in the design and production of printers for many years. Printers that are now successfully operating in all kinds of business environments, like the ever popular RX-80 and FX-80. With speeds of 100 CPS and 160 CPS respectively, dot addressable graphics and optional tractor feed available on the FX model, these two machines are extremely reliable and widely used.

The RX-80F/T has the same

The Fleet



dvanced features as the RX-80 ut having both friction and tractor ed as standard, it's a totally versa- le machine at a thoroughly realistic rice.

With an ever watchful eye on the hanging face of the printer market, pson have identified a growing eed for a high speed printer with ne ability to accept wider paper. hus was born the FX-100, again ncluding all the advantages of its redecessors.

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Monitoring Progress

The versatility and scope gained by using a multi-purpose display unit in the home will be appreciated by micro and TV users alike. Here John Gardner looks at the benefits of such a display and examines in particular the Sony Profeel, a highly adaptable modular television system.

It seems like an obvious enough requirement: a colour monitor that also receives broadcast television signals. With the ever-increasing growth of micros in homes across the land, the viability of a multi-display unit seems well-starred. But why is it that the word 'monitor' causes such confusion and meets with such inveterate resistance in TV shops? The response is always the same: 'Sorry, no demand for specials like that,' or 'Try a computer store.' In my case the local computer stores had nothing to offer, but a friend suggested that Rediffusion might be of help.

Rediffusion's Television Receiver Monitors (TVRM) have a standard aerial socket, another for direct signals from video recorders and micros such as the BBC. They don't have RGB inputs.

What is a monitor?

A video monitor is a television with certain parts removed. It gives a better quality picture than a television but, size for size, is more expensive. This apparent paradox can be explained by comparing a standard television with a monitor.

A television has a tuner module for detecting the broadcast signal and an intermediate amplifier for separating sound and vision information. These stages are followed by separate audio and video amplifiers, and finally by the output stages: a loudspeaker and a picture tube. If the television is to be used with a video recorder or a micro, a modulator inside the recorder or micro generates a signal with the same characteristics as a broadcast signal. A spare tuning position on the television is set to receive this signal; the television tuner demodulates the signal and displays the required picture.

A television picture is an optical illusion that relies on the persistence of vision. The picture is produced by a single scanning dot that varies in brightness and traverses the screen repeatedly from left to right, moving down the screen slightly every time a new line is started. A screenful of lines is known as a frame. A broadcast signal has 312.5 lines and 50 frames are transmitted every second. To reduce screen flicker, and to enhance the picture illusion, alternate frames of odd and even lines are sent. The lines are interlaced to give a high definition 625-line picture.

Vertical definition is determined by the number of lines in the picture. Horizontal definition is determined by the number of individual dot positions that can be fitted into a line. For the purpose of television reproduction a video amplifier with a bandwidth of about 5.5MHz is required, in order to give good horizontal definition.

No matter how well a modulator is fitted to the micro, no video information requiring a bandwidth greater than 5.5MHz will be resolved by a television. In practice, many modulators fall short of the upper limit. A 5.5MHz bandwidth will give a reasonably clear 40-column display: to achieve an equally good 80-column display requires a bandwidth of at least 10MHz.

This is where the monitor comes in. It is specifically designed as a video display unit (VDU) and it does not have a tuner or a demodulator. Instead of an aerial signal it is fed with composite video, consisting of picture information and synchronising pulses. Inside the monitor there is a high quality video amplifier and a synchroniser to keep the line and frame scans in step with the signals sent by the micro.

Picture geometry will be much better on a monitor than on a television. Horizontal and vertical lines will be straight and true. There will be no loss of symmetry, with the left hand side of the picture more compressed than the right, and so on. These are the things you pay for.

A colour monitor has inherently lower definition than a monochrome monitor of apparently similar bandwidth, because for every single dot of the monochrome picture, three are required to produce colour. A colour picture tube (whether for a monitor or a television) generates three electron beams and these scan clusters of red, green and blue phosphor on the tube face. When scanned by the electron beam the phosphors emit red, blue and green light. The intensity of the light emitted is directly proportional to the R (red), G (green) and B (blue) content in the incoming video signal.

Some monitors have what is known as an RGB input. This gives the best attainable colour quality as virtually all the video amplifier stages are bypassed and the three individual RGB colour signals are fed direct to the respective electron guns.

To summarise, there are three possible types of video signal generated by a micro:

1 Modulated (similar to the signal coming from an aerial lead);
2 Composite Video (picture signal plus synchronising pulses); and
3 RGB (totally separate R, G and B colour signals).

A television can only accept the first of these signals and a monitor can only accept the second and third. A composite signal can be either monochrome or colour; on the BBC Micro, the composite video output gives monochrome only.

Problem & solution

Let's imagine our requirement is a high quality television that:

1 can be used as a computer monitor providing a clear and stable display;
2 can do justice to the sixteen colour mode of the BBC Micro;
3 will look to the future as well as stand the test of time;
4 will provide good sound, vision, geometry and high definition;
5 will provide aerial, composite video and RGB inputs; and
6 is designed as a family television with a screen size of at least 20in.

The Rediffusion TVRM comes close and is good value for money, but it doesn't meet all the criteria, the most important of which is the ability to accept RGB signals. The Sunbury firm of Portatel is highly recommmended, specialising in modifying the Swedish Luxor range. Portatel offers a variety of screen sizes from 14in upwards, and the sets have composite video and RGB socket in addition to the aerial input. The only other firms known to me who supply conversions are Electronequip in Fareham and Newark Video Centre in Balderton; Electronequip sells the Nordmende, and Newark Video the

Grundig. These are conventional sets supplied ready wired with a cable (peri-TV) socket which accepts RGB signals. The Nordmende is unsuitable because only a 14in screen is available, which is fine if the set is primarily to be used in conjunction with the micro but not appropriate for family viewing. Newark offers a variety of screen sizes and the Grundig is very similar to the Nordmende, which leaves the Sony Profeel.

Sony Profeel

The Profeel is a modular television system in much the same way that a hi-fi system comprises a number of audio modules. The essential units are a monitor, tuner/control unit and loudspeakers, and it's possible to add other attachments such as a Teletext adaptor or a video camera.

In common with other Sony colour televisions, the Profeel monitor has a Trinitron tube. This differs from virtually all other makes in that a single electron gun is used to generate all three beams (red, green and blue). The Trinitron tube is longer than most and therefore requires a deep cabinet, but it has the twin advantages of excellent convergence and accurate geometry.

The only visible control is an on/off button but all the usual features (brightness, contrast, and so on) are present, concealed behind a front panel. There is an input at the back for the tuner signal, which is to either PAL (UK) or NTSC (US) standards. There are additional inputs for composite video, RGB, cable TV, Teletext and audio.

During my evaluation I connected the monitor to the BBC Micro in three different ways, using the following outputs from the micro: TV OUT (modulator), VIDEO OUT (composite video/monochrome) and RGB. To use TV OUT, the micro is connected to the tuner's aerial input and the output from the tuner goes to the monitor. VIDEO OUT and RGB connect direct to the monitor.

The results from the aerial input greatly exceeded my expectations. Colour and monochrome display were very good, giving a stable picture with just a small amount of background noise. Faint interference patterns occurred when several colours were overlaid. Definition was good but less crisp than a monochrome display (although it would not be suitable for large amounts of 80-column word processing work).

When the composite video input was used the display was rock steady, crisp and clear, with negligible background noise and complete freedom from interference patterns. In 80-column mode the display was better defined but again not up to word processing standards. Unless you're prepared to pay a great deal of money for a purpose-built high resolution monitor, it's probably best to stick to monochrome for word processing.

In use the RGB input enables very good resolution and brilliant colours: it gave by far the best reproduction I have ever seen of BBC graphics. A 34-way connector is required to feed the RGB signal to the Profeel, similar to the one on the end of the disk drive cable which plugs into the header socket on the micro. There is no information on the pin connections in the handbook for the Profeel, but Fig 1 shows ideal connections which have been confirmed with Sony: the signal levels match perfectly.

A small but highly commendable feature of the Profeel system is the quality of all plugs, sockets and leads used, something that many manufacturers of domestic equipment overlook. A case in point is the BBC Micro. It comes with a flimsy video lead that has a badly soldered phono plug on one end, and a plastic bodied co-axial plug on the other.

All video leads on the Profeel are connected via BNC or other professional standard sockets and the overall standard of engineering is exemplary.

Conclusions

In terms of absolute performance there is not a great deal to choose between the modified Luxor and the Sony system. Where the Sony comes out on top is in terms of versatility. The tuner module is also a control unit and the various inputs (television, video recorder, micro and camera) can be selected without any replugging..

The Sony system is highly adaptable and need never be outdated. If technology moves on in one area you simply replace the outdated module and leave the rest of the system unchanged. As the TV set is gradually becoming an integral part of home entertainment incorporating audio, video and micro equipment, the modular approach is the only logical development.

At first sight, the Profeel looks expensive — over £800 for monitor, tuner and speakers. However, it has a working life of well over 10 years so buying one is cheaper than renting a standard TV set long-term.

FOOTNOTE

Composite video input for Pye portable TVs (models 190, 191, 196) and any Philips model with a TX chassis.

The modification required to provide a composite video input is relatively simple. All you need is the nerve to unsolder one transistor! The steps are given below. (**PCW *is happy to provide John Gardner's guide to the operation but you undertake it at your own risk.***) **1** Locate transistor TS350. **2** Unsolder the three legs (base, emitter, collector) and carefully remove the transistor. (A solder sucker will be useful.) **3** Bend the base leg out at 90 degrees and resolder the other two legs. **4** Fit a double pole changeover switch to the back of the cabinet. **5** Solder screened lead 1 to the base leg of the transistor. **6** Insulate the joint with a rubber sleeve. **7** Solder the other end of lead 1 to the centre contacts of the changeover switch. **8** Solder screened lead 2 to the hole left vacant by the transistor. **9** Don't connect the screen at the circuit end. Make sure it is insulated. **10** Connect the other end of lead 2 to one side of the changeover switch. **11** Fit a BNC socket to the back of the cabinet, close to the changeover switch. Earth the socket to chassis. **12** Solder screened lead 3 to the BNC socket; connect both signal lead and earth. **13** Solder the other end of lead 3 to the other side of the changeover switch. **14** Link together the contacts on the 'earthy' side of the switch.

Full details: Philips Service, 604 Purley Way, Croydon CR9 4DR. **END**

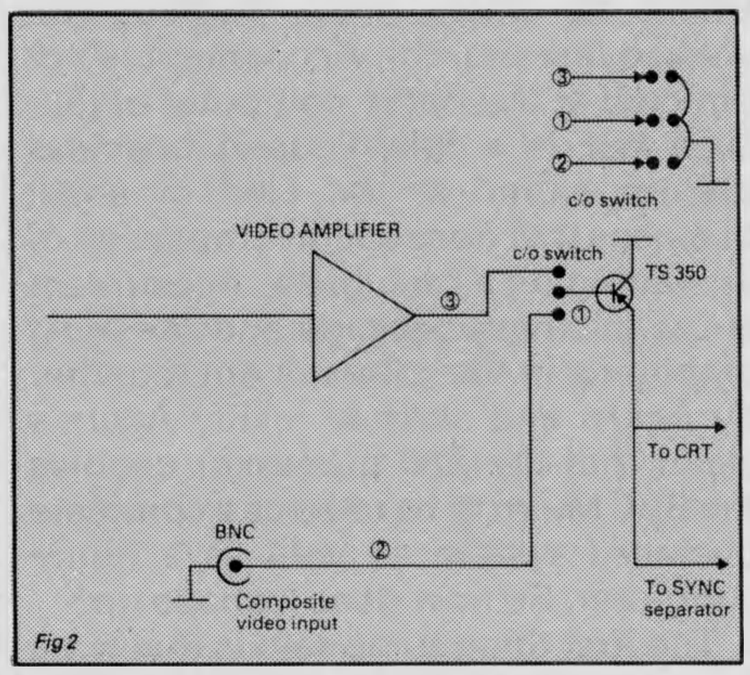


Fig 2

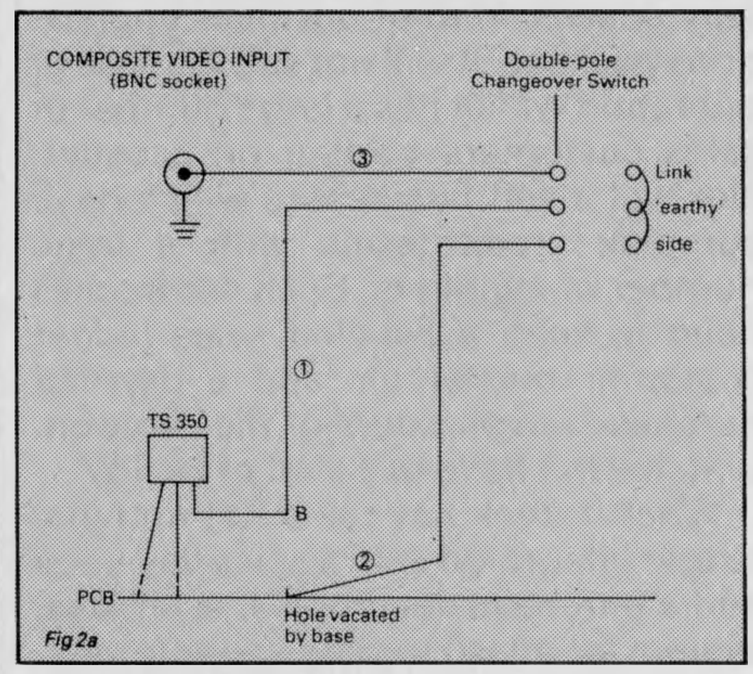


Fig 2a

Figs 2 & 2a Composite video input connections

SIGNAL	BBC RGB PINS (viewed from solder side of plug)	PROFEEL SOCKET PINS	
R	1	25	10k.ohm resistor between pins 19 and 33
G	2	26	
B	3	27	
Sync	4	30	
Ov	5	8	

Fig 1 Sony Profeel pin connections



Accountant

Continuing our series on the software bundled in with Acorn's Z80 processor for the BBC Micro, Tony Harrington examines a flexible and easy to use bookkeeping package from Compact Accounting Services.

Accountant, a bookkeeping package produced by Compact Accounting Services, is part of the bundle of free software supplied with Acorn's Z80 second processor for the BBC Model B. Unlike its stable mate, Nucleus (reviewed last month), Accountant is not directed at the home computer enthusiast but is a fully-fledged business system aimed at the kind of small business that does a high proportion of its trading on a cash basis. Accountant is *the* business package and *the* most ambitious in the software put together by Acorn and aims to justify Acorn's claim that the Z80 processor enables the BBC Micro to be used as a complete business system as well as a home computer. So how does it shape up?

The first thing to be said is that it's a very specific kind of business applications package. It will not suit the type of operation which has a large number of sales customers trading on account. Nor will it suit businesses which have complex credit terms with a large number of suppliers. Such companies need to keep a detailed sales ledger customer master file and a detailed purchase ledger supplier file. Accountant doesn't have this kind of facility.

What it does have is a full nominal ledger integrated with a sales day book and a purchase day book. It is an ideal system for a cash trading environment. Acorn deliberately opted for a cash trader type system which it commits to the lower end of the user market.

Since there are a great many more small businesses running on a cash basis than there are companies who need full sales and purchase ledger facilities, this is probably a smart marketing move. Someone else will doubtless produce a sales ledger and a purchase ledger package soon enough for anyone who wants to run these on the transformed Beeb. (Compact Accounting Services has an integrated suite of business packages on offer.)

Accountant consists of three diskettes: the Compact 'Start-of-Day' program disk (also needed for Nucleus); the Accountant program disk; and a demonstration data disk. This last contains the accounts of Joe Public and is designed to show potential users what a properly structured and coded nominal ledger should look like. This is a very positive step since potential users without bookkeeping experience will need all the help available.

An EPROM chip, provided free with the purchase of the second processor, controls communications between the two processors. It slots into a socket under the keyboard and — as with all EPROMs —, provided you don't get clumsy and bend the pins, is not difficult to fit.

Accountant is a menu-driven system, with a hierarchy of sub-menus, and closely resembles Compact's standard business packages — including Nucleus — in its approach. Movement backwards and forwards through the various levels of menu is simple, so all the functions of the package can be easily accessed. Hitting RETURN, for example, instead of selecting a numbered option from any menu automatically takes you back to the next highest menu level.

In use

Booting up the program follows the standard Compact formula. The 'Start-of-day' disk has to be loaded. This prompts for the date and then for the program disk. This in turn takes you through the company selection menu and on to the main Accountant menu with its three main options (the fourth is simply an exit from the system)

SYSTEM MENU

1 Nominal ledger
2 Sales daybook
3 Purchase daybook
4 Change disks — other menus

Firstly, the user will have to set up the nominal ledger. By providing a dummy nominal ledger data disk with 80 pre-defined nominal ledger accounts (see Fig 1) Acorn has greatly simplified this task. All that's necessary is to select the account headings needed from the 80 and delete those not required. New headings, or a change in the narrative descriptions on the supplied headings, can be easily made.

A/c NO	DESCRIPTION
100	Sales 1
110	Sales 2
120	Sales 3
130	Sales and work done
150	Opening stock
160	Opening work in progress
180	Closing stock
190	Closing work in progress
200	Depreciation — Plant
210	Direct wages
220	Direct electricity
230	Indirect material costs
240	Indirect wages
250	Factory expenses
260	Subcontractors
300	Purchases 1
310	Purchases 2
320	Purchases 3
400	Directors emoluments
405	Directors pension contribution
410	Salaries and national insurance
415	Wages and national insurance
420	Postage
425	Printing and stationery
430	Telephone
435	Professional fees
440	Administration fees
445	Legal fees
450	Agents fees
455	Accountancy charges
460	Auditor's remuneration
465	Donations
470	Annual return charge
475	General expenses
480	Journals
485	Newspapers
490	Petty cash expenses
495	Papers and periodicals
500	Stamp duty
505	Subscriptions
520	Sundry expenses
515	Rent
520	Rent and rates
525	Water rates

Fig 1 Sample list of dummy nominal ledger accounts

Many suppliers of business packages now provide an illustrative chart of nominal accounts in their manuals. Acorn has gone one better and supplies a full nominal ledger on disk that the user can tailor as necessary.

Selecting option 1 (nominal ledger), brings up the main nominal ledger menu:

Nominal ledger

PROGRAM MENU

1 File creation
2 Parameter maintenance
3 Group file maintenance
4 Master file maintenance
5 Master file print
6 Journal Posting
7 Account enquiry
8 Trial balance
9 Transaction listing
10 Budget/variance report
11 Formatted trial balance
12 Month end routine

The first routine, File creation, structures the data disk and requires no input from the user. Any blank, formatted disk can be used as a data disk once this routine has been run. The program checks to see whether the data files have already been created on that disk. If they have, it tells you that they are already there. A less well-designed system would simply write over the existing datafiles, corrupting all your data. (The program is full of helpful touches like this — there are even screen messages prompting you to check that you have a data disk in drive B, so it's hard to go wrong at this stage.)

Parameter maintenance sounds highly technical, but is quite straightforward. It consists of a very well laid out screen requesting all the particulars of the business (see Fig 2). Any field on the screen can be amended by typing 'AME' at the prompt (for 'amend'). The cursor then goes to the first field on the screen (company name) and works sequentially from left to right across and down. This is a great improvement on the approach taken by some of the leading business applications' suppliers, many of whom restrict the user's access to this part of the package as a security measure to prevent illegal copying.

The difficult area for most users will be deciding what the numbers of the four key nominal accounts on the middle right of the screen should be. But this can be settled later, after the nominal accounts have been set up. Once again, the manual provides a step-by-step approach and gives a clear description of the function of each of the key accounts.

For example, it points out that the VAT control account shows the current financial balance either due from or due to Customs and Excise. It might have added that the balance is the current balance precisely because this account will be automatically updated whenever you post items containing VAT to the sales and purchase daybooks or to the nominal account. (Notice too, that the system provides for up to nine different VAT rates.)

An interesting feature is that users can choose between running the nominal ledger as a stand-alone system or allowing accounts to be updated automatically by entries made to the sales and purchase day book. Some people are suspicious of automatic postings because they like to have the opportunity to check up on the accuracy of entries. Most users, however, will not want to create extra work for themselves by re-keying in data from the daybooks to the nominal ledger and will opt to run the system as designed — as an integrated package.

Few cash-oriented bookkeeping systems have as sophisticated a budget facility as Accountant. Fig 2 shows that by answering 'Y' to 'Budgets used?', a request for the budget period to be used for all nominal accounts appears on the screen. The options are quarterly budgets, monthly or four weekly budgets.

Whatever you select here will apply to every single nominal account. You cannot select a quarterly budget for one set and 12 monthly budgets for another set. The actual budgets are defined when you use option 4, Master file maintenance, to set up nominal accounts. At this point it is possible to ring whatever changes you want (described below).

One of the more difficult features for non-bookkeepers to master is the facility for creating groupings of accounts in the nominal ledger. There is no necessity for this facility (option 3, Group file maintenance) to be used at all; however, it does provide a powerful reporting tool.

The manual provides an example (not a particularly clear one) of how group codes can be used (much more detailed examples are provided at the back of the manual). If the user is part of a company consisting of a number of individual departments, the group codes can be used to analyse expenses, for example, to each individual department. This level of detail would otherwise be lost since all expense postings would go to one or another nominal expense account. Without the group code there would be nothing to show what proportion of the total expense in that account was due to the activities of which department.

The group codes come into their own when you run option 11, Formatted trial balance report. This differs from the Trial balance (option 8) in that it groups together all the accounts by group code, providing separate subtotals for code's nominal account balance.

Group codes are two-digit numbers (0 to 99). Each code can be described with up to 40 alphanumeric characters. In the back of the manual there are several examples of just how the trial balance can be formatted using these codes.

Setting up the nominal ledger is done using option 4. There is a very clear screen layout which prompts the user through this stage. But you do have to have a worked-out nominal ledger

Your company name
** **DAYBOOK PARAMETER LIST** **

Company	: T Harrington	Fin year end	: 01/04/84
		Current period	: 03/84
Address 1	: 81 Hornby Road		
2	: Brighton	VAT reg no	: 123 445677
3	: East Sussex	VAT period end	: 03/84
4	: BN2 4JH	VAT period	: Q
Stand-alone nominal?	(Y/N) : N	VAT Control A/c	: 1570
Budgets used?	(Y/N) : Y	Credit Sales Control A/c	: 1320
		Credit Purchase Control A/c	: 1500
		Bank account nominal code	: 1380
Budget periods	(4/12/13) : 12		

VAT rates:	0	1	2	3	4	5	6	7	8	9
	0.00	15.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Fig 2 Screen layout showing business details

Joe Bloggs Ltd NOMINAL MASTER FILE UPDATE 62 NLMFUP

Function: (CRE/AME/REV/DEL/END) AME

ACCOUNT	GROUP	TYPE	DESCRIPTION	BALANCE	YEAR TO DATE
210	03		Direct wages	0.00	0.00

(or END)

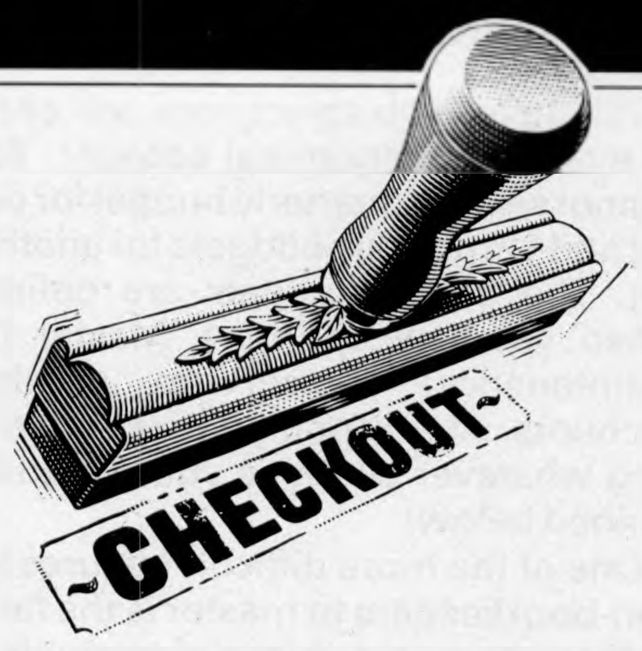
BUDGET TYPE
0 = No budget
1 = Equal budgets
2 = Variable budgets

TOTAL BUDGET
20000

1	2	3	4	5	6
1666	1666	1666	1666	1666	1666
7	8	9	10	11	12
1666	1666	1666	1666	1666	1666

Correct account? (Y/N)

Fig 3 Nominal ledger screen layout



account structure before you begin. The screen will look like Fig 3.

The layout on the entry screen is quite clear and specific. If you were to opt to use budgets on any particular account, the system would either automatically spread your total budget amount across all 12 periods (if you selected 12 rather than four or 13 in option 2, Parameter maintenance), or will allow you to insert values independently for each month. This gives users a powerful management tool, since the budget variance report shows at a glance how far the actual input to any nominal account varies from the expected input. Again, this is not a feature that every user will want. But even traders who have never bothered to formalise their expectations into a proper budget will find it an interesting facility to play about with.

Technically, the most important thing about Accountant's nominal ledger is that it is totally free format. Nearly all the systems aimed at users at the smallest end of the business scale have a great deal of structure built into the nominal ledger. This means that ranges of account numbers are already predetermined as either sales accounts, purchase accounts, expense accounts or balance sheet accounts. Accountant gives the user eight digits to give a unique number to each account.

In addition to group codes, there is also a single digit account type number. This doesn't affect the machine's treatment of the account in that it does not influence sorting routines. But the type number shows up on printed reports, so, provided you know why you have chosen to call a particular account group 3 type 4, it gives you another level of analysis.

Once the accounts are set up, Accountant is ready to go. There are three ways of getting values into nominal accounts. Option 6 on the nominal ledger entry, 'Journal posting', is used for direct entries to nominal accounts, without going through the sales or purchase ledger daybook posting routines (which represent the other two routes into the accounts).

Users without bookkeeping experience might be confused by having three routes in, but there is an obvious logical need for this and all programs which combine sales, purchase and nominal ledger functions require these three routes. The manual, once again, has a clear explanation as to the use of the nominal ledger posting routine: it's primary use is to input opening balances into each nominal account at the time the system is set up.

Thereafter, the Journal posting route is used whenever values change for reasons other than a direct sale or purchase. These would include month-end adjustments, petty cash analysis, pre-payments and accruals, and so on. As with all entries made with Accountant, the printer has to be on line and immediately the user has finished a posting session (indicated by typing 'END') a batch report is produced.

Joe Bloggs Ltd	Compact Menu	Menu 14 01/03/84
Purchase daybook	PROGRAM MENU	AC-123456

1 Credit purchases
2 Cash purchases
3 Miscellaneous payments
4 VAT reports.

Fig 4 Purchase daybook menu

This is important since it gives users a compulsory hard copy record of all entries made into the system. It isn't foolproof, and a clumsy or wayward filing system for the printouts will wreck the good work. (See Fig 3 for an illustration of the batch report produced after nominal ledger journal entries have been made.)

A good point in the entry facilities is that it cuts down the amount of typing involved by providing defaults for the date and for the description. So if you are inputting a number of transactions for the same date or with the same description, pressing RETURN automatically inserts the default date and description in the appropriate fields.

The system is a proper, double-entry bookkeeping system (which means that it always balances to zero since every debit has a corresponding credit entry). This means that batch entries always have to total a zero balance. As soon as this is achieved, the system goes off and updates the files with the values in that batch.

The sales daybook, as mentioned above, does not contain a master file of individual client accounts. It processes and analyses sales invoices, credit notes and cash receipts. It also provides a full output VAT reporting system (while the purchase daybook provides a full input VAT reporting system).

The daybook recognises five different types of batches: invoices, credit notes, cash receipts, cash sales and miscellaneous receipts. Batches have to be sorted into entries of the same type. You cannot post credit notes and invoices in the same batch — a reasonable discipline for the system to impose.

Although Accountant is best suited to cash traders, it can deal perfectly well with goods sold on credit. The sales ledger menu has four options, the first of which is credit sales. This has a sub-menu with three further options for entering invoices, credit notes or cash receipts — all the necessary facilities to cope with a credit environment!

What it cannot do is keep individual customer details and generate customer statements. For that you would need a full sales ledger program, not just a sales ledger daybook. (This comment also applies to the purchase ledger in relation to suppliers.)

The sales and purchase daybook menus are very similar. For the purchase daybook menu see Fig 4 above.

Accountant produces standard, comprehensive reports which should satisfy most users' requirements. There is no report writing module for tailoring reports to the requirements of individual users, but then that is not really to be expected from such a system.

Documentation

The manual is large and comprehensive. It has been rewritten at least twice. The second version arrived a few days before I was due to complete this review and was a marked improvement on the first version. It makes a determined effort to tutor the user whereas the first version makes too many assumptions of the user's level of skill.

Despite the rewrite and the solid effort that has gone into the manual, Accountant is easy enough to use without having to refer constantly to it. There are one or two menu options that users need to be told about, but most of it is common sense.

Conclusion

Accountant is a well-designed and well-written system and justifies Acorn's challenge to users to regard the second processor as a full business system. It *is* a fast system, given the limitations of the BBC Micro's disk drives. (Compact Accounting Services claims that it runs faster than the Sirius.) A lot of work has gone into the manual which does credit to a £300 package.

Although Accountant is part of a bundle of free software, no corners have been cut and little expense spared.

END

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The Challenge. Commodore Computers are pleased to announce their first International Computer Art Challenge, and invite entrants to submit their work for judging by June 1st, 1984.

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How to enter. Leaflets with full details of the Challenge and the entry form are available at Commodore dealers, Commodore User Clubs, most major retail computer shops and at stores with a computer department. In case of difficulty or for additional copies, please write to:

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Micro Animation

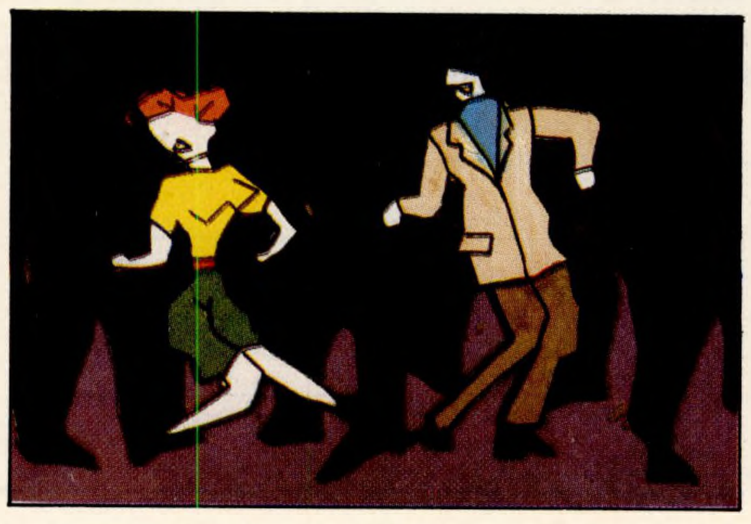
The Faculty of Art and Design at Coventry (Lanchester) Polytechnic has carried out much pioneering work in the development of computer graphics techniques, and in their teaching to students of art and design. Clive Richards, senior lecturer in the Department of Graphic Design, and Simon Ritchie, lecturer in the Department of Computer Science, discuss the application of these techniques in the making of animated films.

Computer graphics systems come in a variety of shapes and sizes, depending mainly upon the power of your computer and the type of pictures you want to draw. For a system to be useful to a cartoon animator, it must automate the process or producing hundreds of similar 'snapshots' of objects in motion.

The most impressive systems are the ones which produce high definition, full colour images of complex objects. These have been used in the making of films like *Return of the Jedi* and *Tron* to shoot scenes which would otherwise have been made with models. This type of animation requires a huge computer and expensive colour display equipment which makes it impractical for hobbyist use.

At Coventry Poly, we teach computer graphics using a much simpler and cheaper system based on a language called 'New Pictures' developed at the Poly by Ron Johnson. New Pictures combines power with economy by carrying out difficult and tedious operations, leaving the artist to 'hand finish' the product where necessary. The computer is regarded as just another graphics tool, like an air brush — good for some types of work, bad for others.

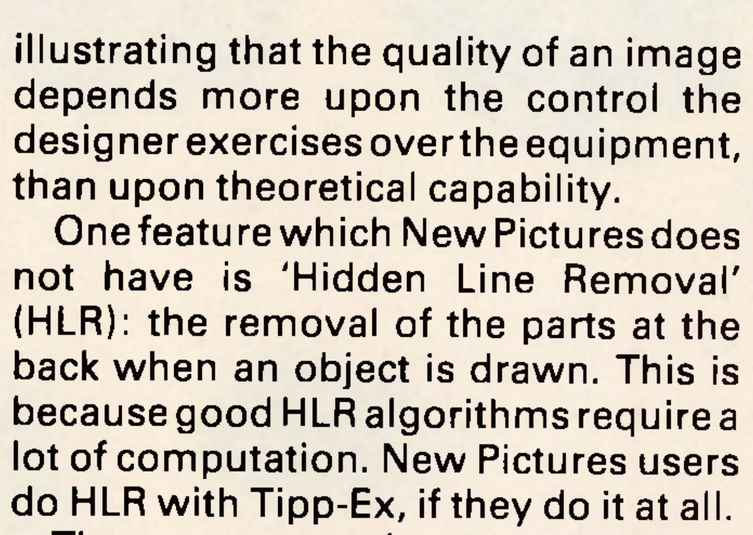
New Pictures is used by 120 art and design students with no previous knowledge of computers to produce animated cartoons and other artwork. In the interests of economy, New Pictures avoids features which make heavy demands on the computer. Students produce results which are just as good as the computer-generated images commonly seen on television:



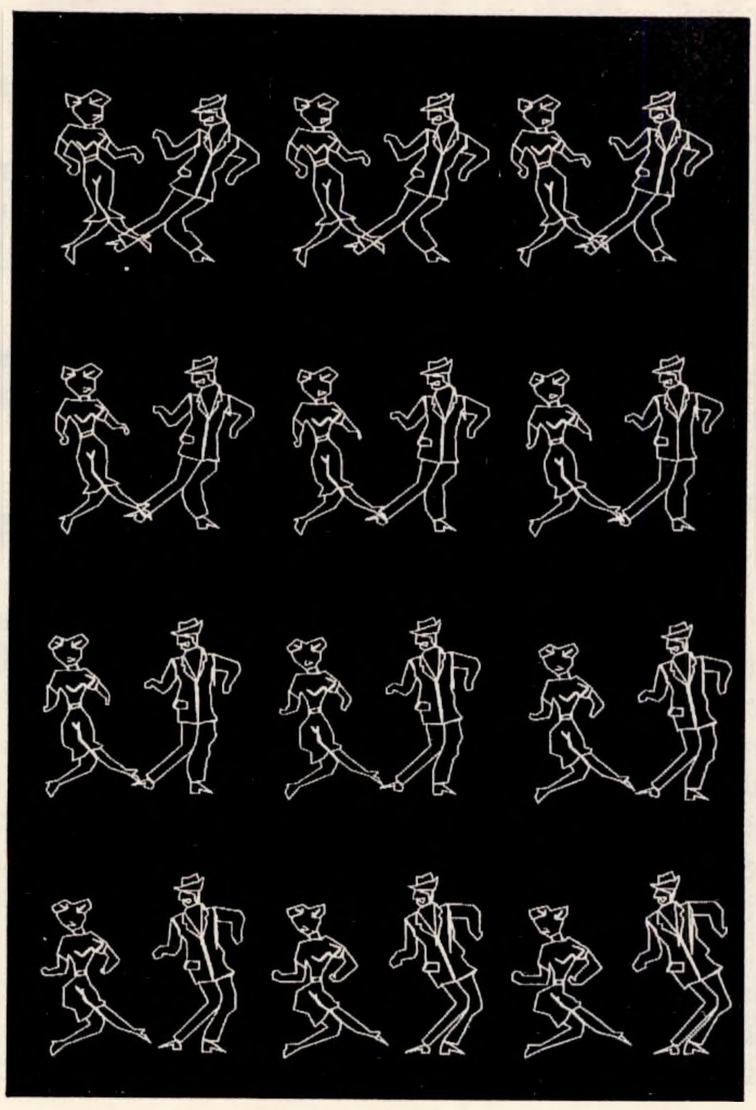
illustrating that the quality of an image depends more upon the control the designer exercises over the equipment, than upon theoretical capability.

One feature which New Pictures does not have is 'Hidden Line Removal' (HLR): the removal of the parts at the back when an object is drawn. This is because good HLR algorithms require a lot of computation. New Pictures users do HLR with Tipp-Ex, if they do it at all.

There are two main areas where this system has an advantage over traditional hand-drawn approaches. These



The Quick Action Recorder produces instant animation sequences from still images



are the generation of inbetweens from key drawings, and the perspective depiction of 3D objects moving through space. Both these approaches are described here.

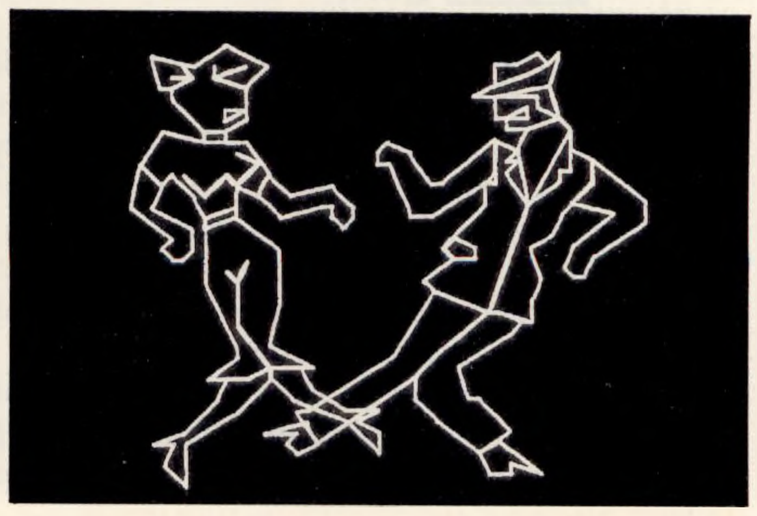
Creating moving pictures

The main stages in making an animation sequence are as follows:

Having decided what is required, the student makes the necessary working drawings by hand: plans or elevations of the object to be animated. The student then maps out the program on paper, following a general structure devised for animation programs. The program is keyed into the computer together with the necessary data taken from the key drawings. For certain drawing tasks the data may be input via a digitising tablet. The program is run and the graphic output is viewed on the screen as a set of still images. When the program is working satisfactorily and producing a usable sequence of pictures, the drawings are plotted on the graph plotter.

Before the graph plotter output is made into animated cells ready for filming in colour, a black and white 'line test' is made. Line tests were once made with a rostrum camera (a single shot cine camera) loaded with black and white film. Each separate line image was photographed in sequence, and after shooting the film was sent off to the laboratory for processing. In a

Hand-painted animation cells made from computer output by final year student Alex Hern for his degree presentation



day or so, when the film was returned, the results could be viewed on a special film editing machine. The individual still images were then seen as a moving sequence for the first time. Any faults with the animation could then be corrected on the line drawings, and the black and white filming process repeated until all was well.

Today, a special-purpose computer called a Quick Action Recorder (QAR) is used. The separate black and white drawings are fed, one frame at a time, into the QAR through a video camera. The images are then played back, in any sequence and at any speed chosen by the operator, who selects his requirements from a variety of operating modes using the QAR's push button controls. In this way, the moving image can be seen on the TV monitor after only a few minutes, rather than a few days later, as was the case when using film. The images stored in the QAR can also be recorded directly onto video tape.

These machines are somewhat expensive, costing around £12,000, but the availability of the QAR has reduced dramatically our bill for black and white film stock. Also, because of the speed with which moving images can be obtained, the QAR has proved to be an excellent means of teaching the techniques of animation.

When a satisfactory sequence of line drawings has been produced, various processes can be applied to them before the final filming in colour, which, at the moment, is still done using the traditional film rostrum camera. Sometimes, the graph plotter drawings are used as a guide for making hand-drawn cells, or else they are photographed to make positive line images on clear film, which are then back-painted.

Another method is to photograph the plotter output and produce a series of negatives (giving white lines on a black background). These can be back-lit through coloured gels to produce the well-known glow-line images we see regularly on the television. Glow-line pictures are generally thought to be a characteristic of computer graphics, but, in fact, most of these images start life as black lines on white paper. This technique was used to make a title sequence for the *Midlands Tonight* current affairs programme (stills from this sequence appear alongside). The computer graphics part of the sequence was produced by staff at Coventry Poly for BBC Television at Pebble Mill, Birmingham, using New Pictures. The glow-line images were produced from graph plotter output and combined with photographic images of the Birmingham night sky using standard cine mixing techniques.

Those working on the most advanced (and consequently most expensive) techniques in computer animation are trying to achieve 'life-like' effects, equal to the best photographic and hand-drawn images. Ironically, some anima-



Midlands Tonight *title sequence designed and produced by Dick Burn of the BBC. Computer graphics by Coventry Polytechnic staff*

tion studios, which don't even have computers, try to imitate the high-tech look of computer graphics. We know of a small firm which had to make an audio-visual presentation on Computer Aided Design for a large electronics company. The audio-visual firm bought an Airfix model of a jetplane, sprayed it white, and put black transfer lines on it at strategic places. They suspended the model on two pins in front of a white board. Using a stills camera loaded with black and white film a series of pictures was taken, turning the model slightly between each shot. The resulting negatives were then animated to produce a spoof computer graphics sequence. As one of the partners pointed out: 'It was a very quick and cheap way to produce computer animations.' We noticed that the technique removed the hidden lines very effectively!

At Coventry Poly, the use of the computer is encouraged only in design projects where results cannot be produced more quickly or easily by any other method. For example, using New Pictures we can see through, and even fly through, wire line objects: this can't be done with models.

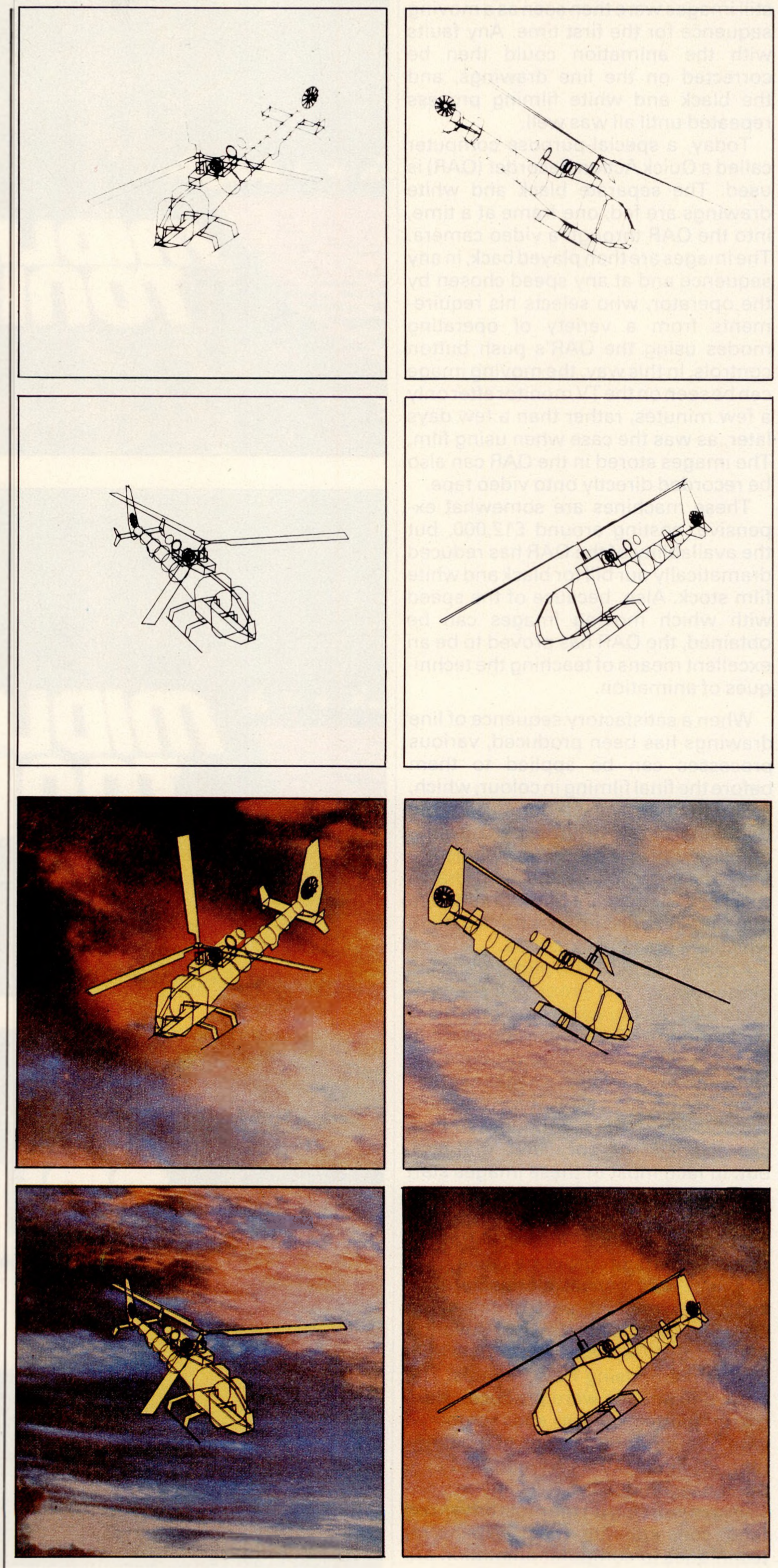
Concepts

An example of a simple New Pictures cubes program is shown in Fig 1. It is fairly easy to read once you understand the basic concepts. The language is designed to be readable, so is rather verbose. Typing in such a program from scratch would be tedious but we have developed various ways around this problem. We now think that the best approach is to have the system accept a very terse version of the language: Shortspeak. The computer will then produce the readable version itself. (A version of New Pictures which works this way is under development.)

New Pictures draws a series of 'frames' on the plotter, each frame being a separate picture: that is, a separate animation cell. The DRAW FRAME instruction sets up a new frame and draws its edges. Drawing is then confined to this frame and objects are clipped if they spill over the edge.

A 'path' is a collection of connected straight lines, represented internally as a list of 3D coordinates centred on the current frame. The first line is represented by the coordinates of its start point and end point, and the other lines by the coordinates of their end points; a path which is a square is represented by five points. A path does not need to be closed — that is, the first point and the last point may not be the same. A path can be created by reading coordinates as data or by moving an imaginary point through space and repeatedly recording its position.

An 'object' is a collection of paths. To



Back-painted computer output by second year student Simon Cheshire as part of his course work

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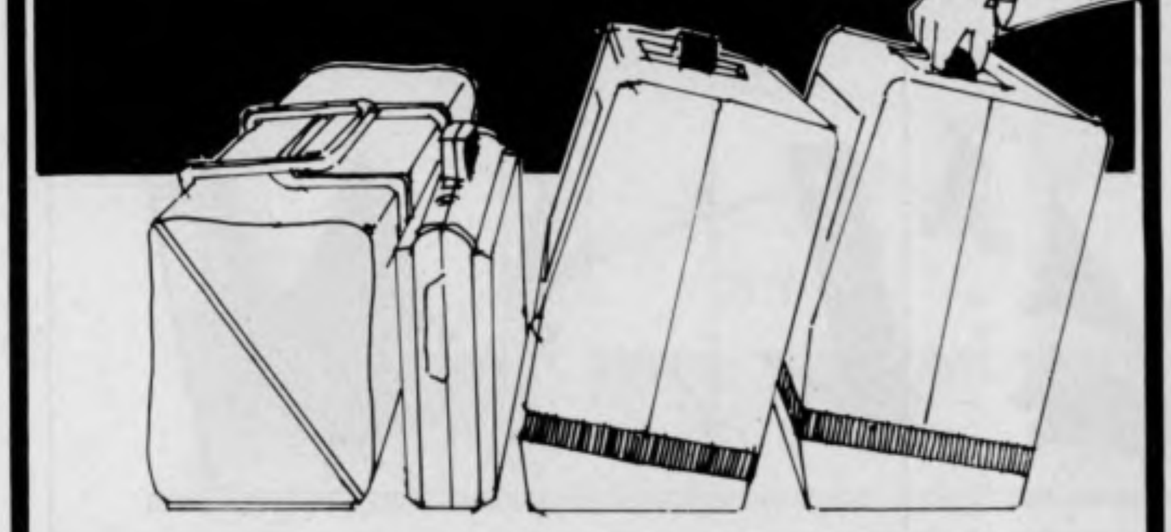

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draw an object, the user writes a subroutine which calls the necessary drawing instructions.

Objects are drawn in *perspective*: drawn as they would be seen from a specified viewpoint. The mathematics of perspective can be described using O-level geometry (the theory of similar triangles) and has been understood for centuries. The problem of drawing a perspective view of a set of lines in 3D space is a perfect task for the computer, being a repeated application of a simple formula. Artists are often surprised that the computer can draw perspective views, because they regard it as difficult. On the other hand, they are disappointed at the trouble they have to go to to describe an object to the computer, when they can draw it themselves in a few minutes. Drawing a path which is 'inbetween' two other paths is also very simple.

Future developments

What does it run on, how much is it and where is it available? New Pictures is not available — yet. Implementing a package within a college is relatively easy, as courses can be run explaining how to use it. Producing a version which is well enough supported and documented for general use, is a bigger job but we are now committed to doing this.

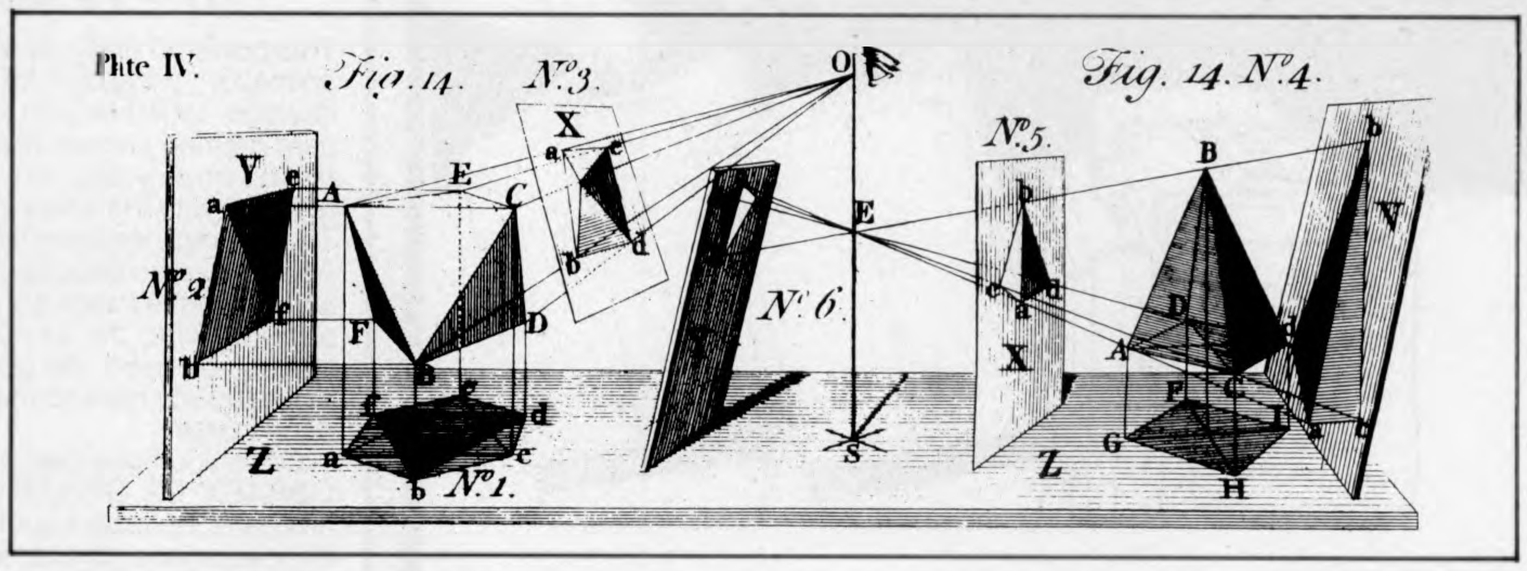
New Pictures is implemented on an Apple III computer, and on the Poly mainframe. Plans are well advanced to create a computer graphics workshop using 16-bit micros running this system.

The cost of hardware to run an implementation of the system for professional use is now below £4000. The most expensive component of such a system is not the computer, but the high quality plotter which a designer demands.

If you just want to draw pictures on a television and don't mind waiting around before the result appears, then we are confident that we shall be able to develop a version of New Pictures on a system for the cost of the BBC Micro in the not too distant future.

Next month: micro animation entry form, rules and categories.

END



Eighteenth Century illustration of the rules of perspective from Treatise on Perspective *by Thomas Malton*

```
start of program
A5 paper

draw frame

draw frame
read points
draw 1st path

draw frame
eye at distance 40mm
back 30mm
draw 1st path

draw frame
new path
copy 1st path
cancel transformations
draw 1st path
draw 2nd path
draw lines from 1st path to 2nd path

do next block of actions twice
draw frame
draw 1st path
draw 2nd path
draw lines from 1st path to 2nd path
draw sequence of 7 paths between 1st path and 2nd path
move viewpoint up 20mm
move viewpoint right 20mm
end of block

end of program
```

The data for this program is:

```
15  15  -15  15  -15  -15  15  -15  15  15
99999
```

The 99999 marks the end of the data

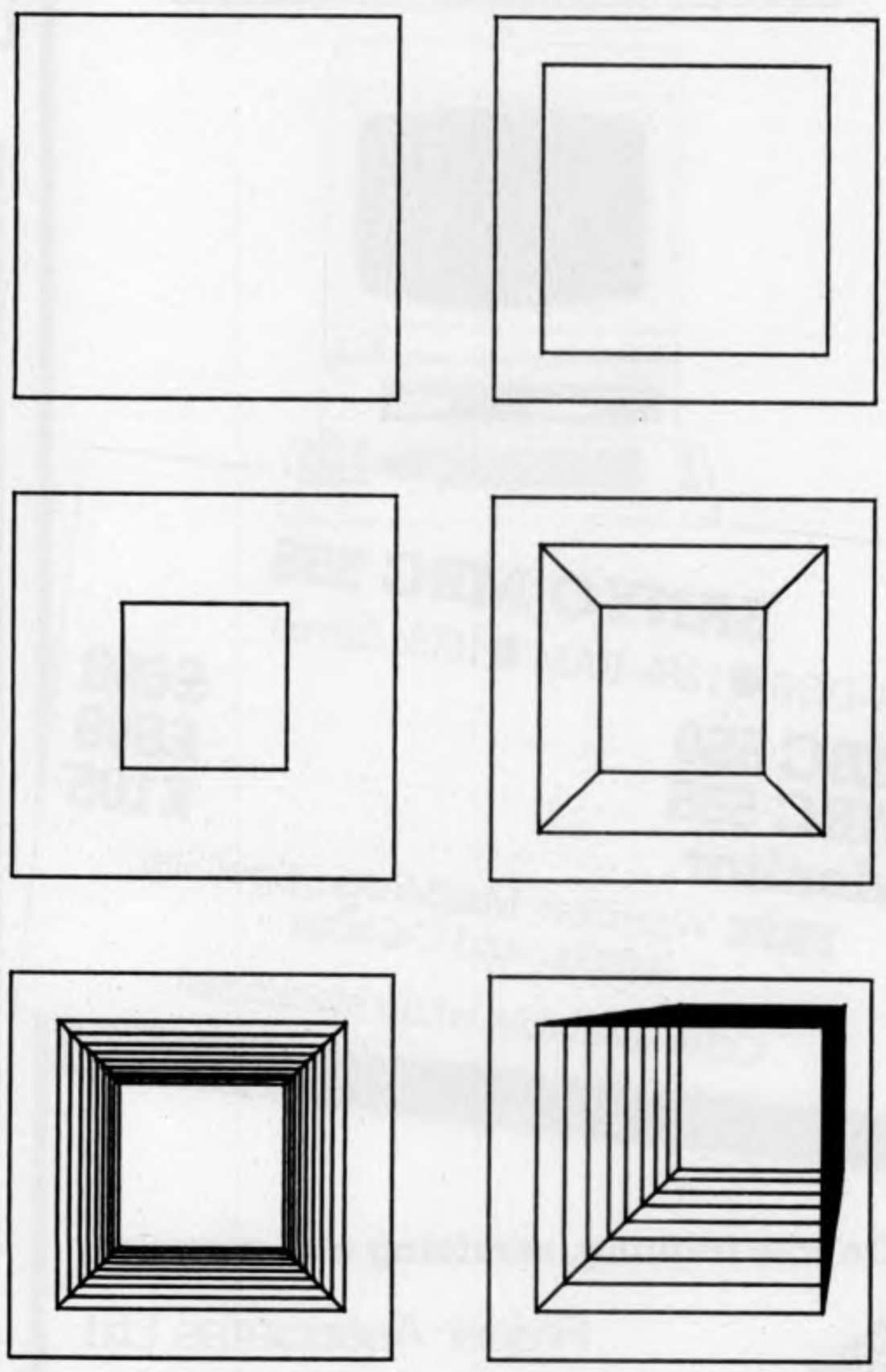


Fig 1 Cubes program and output

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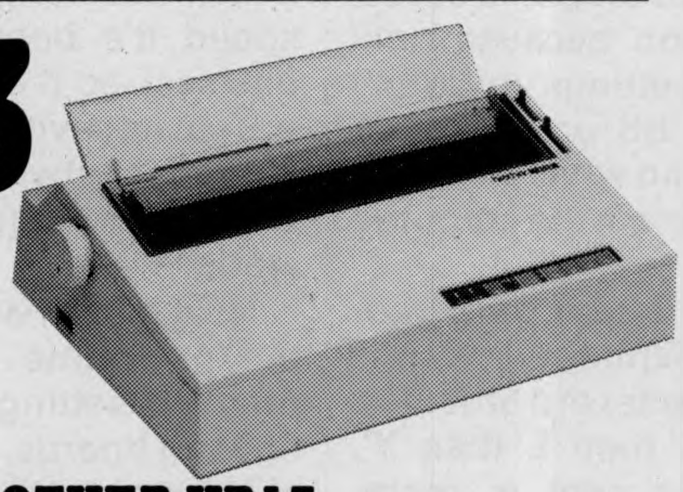

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EX43/4 fabric **£7** EX43/4 carbon **£3** Diablo/Qume **£5**
Epson 100 **£11** Epson 80 **£4** Juki **£1** Star/Microline **£2**

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Apple interface & cable **£72**
BBC cable **£15** IBM PC cable **£21** RS 232 cable **£31**

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PCW 205

NETWORKS

Peter Tootill helps you sort out your modem difficulties and explains the procedure of start and stop bits.

The following bulletin boards have closed down: **Forum 80 Milton Keynes; Efficient Chips; CBBS North East.**

Growth in modems

The price of budget modems in the UK is still well above that in the US, especially when you take into account an American's higher disposable income. A cheap modem there costs around $75, but a significant part of the UK price must be due to the cost of getting and keeping the necessary approval to connect to BT's telephone lines. This approval is now being given by the 'British Approvals Board for Telecommunications' (BABT) and not by BT itself. Even BT has to get its products approved by the BABT! The result of the change has been a steep increase in charges, which can amount to several thousand pounds for modem approval compared with the few hundred that BT used to charge. This is a strong disincentive to firms wanting to produce modems at reasonable prices.

Current experience indicates a large market for modems at reasonable prices, and I'm sure it won't be long before we see them for sale in the High Street chains, alongside microcomputers and alternative telephones.

Association of Free Public Access Systems (AFPAS)

With the increasing number of new bulletin boards (BBs), it's worth mentioning that AFPAS is an organisation formed in 1982 for the operators of free public access systems. These systems are available at no cost to the user utilising basic facilities. The object of AFPAS is to assist people wishing to set up BBs and to ensure consistency in operating standards and protocols.

Those interested should contact the secretary, Mr Fred Brown, for details of the Association. His address is 421 Endike Lane, Hull, HU6 8AG (*sae* please).

If anyone is thinking of starting a new BB, it would be well worth considering using 1200/75 speeds for people with Micronet or Prestel modems. There are a couple of BBs that provide this service but there's room for quite a few more. Many people have Micronet packages, or have access to a Prestel set, and would like to be able to call other systems as well as Prestel.

New standard for RS232 connectors

Before you can use your shiny new modem, whatever make it is, you will need a cable to connect it to the RS232 output of your microcomputer. Here you could find a problem, because although more and more micros are being produced with RS232 interfaces, manufacturers have departed from the normal 25-way connector that the standard specifies. The budget modems that are appearing are showing the same trend. The reason is, presumably, that the 25-way connectors are large and expensive, and only a few of the pins are used in most applications.

It's a pity that a standard for a small RS232 connector has not been produced in time to prevent the plethora of different types that are appearing. I have come across devices using 4,5,6,7 and 8-pin DIN connectors recently. Even those with the same number of pins don't use the same DIN plug, or if they do they are connected up differently.

In an attempt to introduce some standardisation in this area, *PCW* will shortly be launching a suggested standard of RS232/V24 connectors using from 3 to 7(8) pins. We hope manufacturers who are producing modems and serial interfaces not using the normal 25-pin connectors will consider using the *PCW* standard instead.

There will be no licence fees; it will just be an attempt to introduce some order into the chaos that has already arisen in this field with each new product having its own type of connector.

As far as we are aware no such standard exists, not even a *de facto* one, but if anyone knows anything different, please let us know.

Network jargon

Word length, start and stop bits sometimes cause confusion because until you have the correct settings you won't be able to talk to a BB or any other system at all. I'll explain what the terms mean, and then I'll explain the common standards in use.

When information is sent from your computer along a telephone line, it is transmitted one character at a time. The word 'KEY' is sent, 'K' then 'E' then 'Y'. Each character being sent is represented by a code number which comes from the list of ASCII codes. And, just as in Morse code where a letter is sent by a series of dots and dashes, in our systems each is represented by a series of noughts and ones that make up the binary version of the code for the character concerned. (The ASCII code is used internally by most microcomputers. You can check the actual ASCII code for a letter on most micros by typing, for example:
PRINT ASC("K").

The ASCII code list is sometimes called the International Standard alphabet number 5. The complete set of ASCII codes comprises 127 characters ranging from control codes, through numbers to upper and lower case letters. All 127 can be represented by a binary number, 7 bits (or binary digits) long.

Back to our example; the letters K,E and Y are represented in the ASCII code by the numbers 75, 69 and 89. In binary form these become:

Letter	Decimal code	Binary code
K	75	1001011
E	69	1000101
Y	89	1011001

Now we have our characters in a form that we can send down a telephone line — one bit at a time. This is done by using tones of two different frequencies — a high tone to represent the binary zero, a lower tone to represent binary one.

There is still one problem: suppose the first character we send ends with a zero bit, and the next starts with a zero bit as well, or if one ends with a one and the next starts with a one? How does the receiving system tell where one character finishes and the next one starts? The answer is to use extra bits, known as start and stop bits. The convention is that a character always begins with a start bit, which is a low tone, and ends with one or two stop bits, which are high tones. In this way the receiver knows that when the tone changes from high to low, the next character is beginning.

The start bits are also used for timing purposes. The receiving computer knows how long each bit will take at the speed it's been set to (usually 300 bits/sec), so it can divide the character up into its seven bits and it doesn't need anything between the individual bits to tell it where one finishes and the next starts.

Next month we'll look at parity, but in the meantime, here are the recommended settings to use when calling bulletin boards, etc:

a) Normal settings:
7 data bits, one stop bit, even parity.

b) Alternative settings:
8 data bits, one stop bit, no parity

The alternative settings should work with most systems, and are essential if you want to use the 'XMODEM' file transfer protocol.

If you find you are having problems try the (a) settings. One or other should work with all the systems listed here, and the majority of others also.

Modem Operating Frequencies

Modem Type	Speed (Bit/s)	Duplex	Transmit Frequency 0 Hz	Transmit Frequency 1 Hz	Receive Frequency 0 Hz	Receive Frequency 1 Hz	Answer Tone Freq Hz
CCITT V.21 Orig	≤300	Full	1180	980	1850	1650	—
CCITT V.21 Ans	≤300	Full	1850	1650	1180	980	2100
CCITT V.23 Mode 1	600	Half	1700	1300	1700	1300	2100
CCITT V.23 Mode 2	1200	Half	2100	1300	2100	1300	2100
CCITT V.23 Back	75	—	450	390	450	390	—
Bell 103 Orig	≤300	Full	1070	1270	2025	2225	—
Bell 103 Ans	≤300	Full	2025	2225	1070	1270	2225
Bell 202*	1200	Half	2200	1200	2200	1200	2025

**** Bell 202 has no back channel as such, only a 5 bit/sec on/off signal (387Hz = on, no signal = off) used for handshaking. (CCITT V22 & Bell 212A do not use single frequencies like these and cannot be simply included in such a table.)***

UK systems run by commercial organisations, which are free at least in part:

DISTEL. Tel: (01) 679 1888. Run by Display Electronics (new and surplus electronic and computer equipment, components, etc). The system provides information about stock lines, credit card sales, and some message facilities. 300 baud only at present. Cost: free. 24 hours.

REWTEL. Tel: (0272) 236628. Run by *Radio and Electronics World*, the publishing side of Ambit (electronics components suppliers). Information on stock lines, some message facilities, credit card sales; the latter only for subscribers. 300 baud only at present. Cost: limited areas free, remainder £10 pa. 24 hours.

MAPTEL. Tel: (0702) 552941. Run by Maplin (electronic components and micro-computers). Provides information on stock levels, credit card sales to existing customers only. 300 baud only. Cost: free. 24 hours.

Subscriber commercial systems in the UK:

PRESTEL. Subscribers only: Prestel consists of a database made up of individual pages provided by many different organisations (not by Prestel itself). 1200/75 baud service at local call rates for a large percentage of potential users. 300 baud service on London telephone number only, at present. Cost: domestic subscribers £5 per quarter and no time charges outside peak periods, 80 per cent of pages are free. Business users: £15 per quarter and 5p/minute up to 6pm and Saturday mornings, no time charges outside these hours (time charges also apply to domestic users). Information: tel: Freefone 2296.

MICRONET 800. An organisation providing information within the Prestel database specifically aimed at microcomputer users. Service details as Prestel. Cost: £50-£75 joining fee (covers acoustic coupler and software—for a limited range of machines at present) and £8 per quarter on top of normal Prestel charges. Information: Micronet 800, 8 Herbal Hill, London EC1R 5JB. Tel: (01) 837 3699.

Subscriber business systems in the UK:

Commercial systems aimed at business users:

TELECOM GOLD. Info from: Julie Ireland, 42 Weston Street, London SE1 3QD. Tel: (01) 403 6777.

COMET. Message handling system giving user facilities for leaving and retrieving messages: costs £30 per month. Info from: John Douglas, BL Systems Limited, Grosvenor House, Prospect Hill, Redditch, Worcs. Tel: (0527) 28515.

UK networks

CBBS South West . . . Tel: (0626) 890014. Hours: 24 hours daily.

Mailbox-80, Stourport . . . Tel: (0384) 635336*. Hours: 6pm-8am daily (ring-back system).

Forum-80 Hull . . . (Forum-80 HQ) Tel: (0482) 859169. International electronic mail, library for up/down loading.

Forum-80 Users Group, PET Users section shopping list system. Hours: Tues/Thurs 7-10pm; Sat/Sun 1-10pm; nights, midnight-8am, US (Bell 103) standards.

Forum-80 London . . . Tel: (01) 902 2546. Electronic mail, library for down-loading. Hours: 7-10pm weekdays; midday-10pm weekends. Ring and ask for Forum-80.

CBBS London . . . Tel: (01) 399 2136. Facilities: electronic mail, program downloading. Hours: Sun 5-10pm.

Mailbox-80 Liverpool . . . Tel: (051) 428 8924. Electronic mail, down-loading, TRS-80 information. Hours: 24 hours daily.

TBBS, London . . . Tel: (01) 348 9400. Hours: daily 9am-7am.

BASUG . . . Tel: (0742) 667983. Hours: 24 hours daily.

Computer Answers . . . Tel: (01) 631 3076. Hours: 24 hours daily.

CBBS Surrey . . . Tel: (04862) 25174. Hours: 24 hours daily.

Blandford Board . . . Tel: (0258) 54494. Hours: 24 hours daily.

Note: Estelle. Tel: (0279) 443511 V21 (Datel 200); (0279) 441188 (Datel 600); (0279) 441222 (Datel 1200). For customers of STC Electronic Services. Office hours only.

Southern BBS. Tel: (0243) 511077. Messages, down-loading. Hours: 8pm-2am daily (ring-back system).

*Ring-back system—dial the number, let phone ring once and then ring back.

American/Canadian networks

TYPE	SYSTEM NAME	NUMBER	NOTES
Forum 80	HQ System	0101.816-861 7040	
CBBS	HQ System	0101.312-545 8086	
FBBS	HQ System	0101.312-677 8514	
ABBS	Ottowa, Ontario	0101.613-725 2243	
ABBS	HQ system	0101.703-255 2192	
MABBS	Fort Walton Beach	0101.904-862 1072	
Bull-80	Alabama	0101.205-492 0373	
Conn-80	Colour Computer	0101.212-441 3755	colour graphics for TRS-80 Colour

European networks

ELFA	ABC-MONITOR Sweden	010.468 730 0706	Half duplex
ABC-Banken	Halmstadt, Sweden	010.463 5110771	
ABC-MONITOR	ABC Club of Sweden	010.468 801523	Passwords required
CBBS	Gothenburg, Sweden*	010.463 1292160 010.463 1690754	75/1200 baud 300 baud
	Helsinki	010.358 0722272	

*After receiving the tone and connecting your modem, either type <C/R> or type: <COM C/R>. The system then asks for a password which is: 'cbbs' *in small letters*!! If you only get '>' when you dial up, the system needs resetting and you type <I> C/R.



Minor Miracles WS2000

The development of multi-mode modems will eradicate the dilemma of having to select the correct standard for the required service and will have the added bonus of allowing users access to a wide range of services within the telephone network. Peter Tootill examines one of the cheapest and most competitive on the market: the sub-£100 WS2000 from Minor Miracles

PCW *obtained special permission from BT to connect the WS2000 to the public telephone network for testing. But remember that it is illegal to use a modem that has not been officially approved on the network. Minor Miracles expects to get this approval for the WS2000 in the next few weeks.*

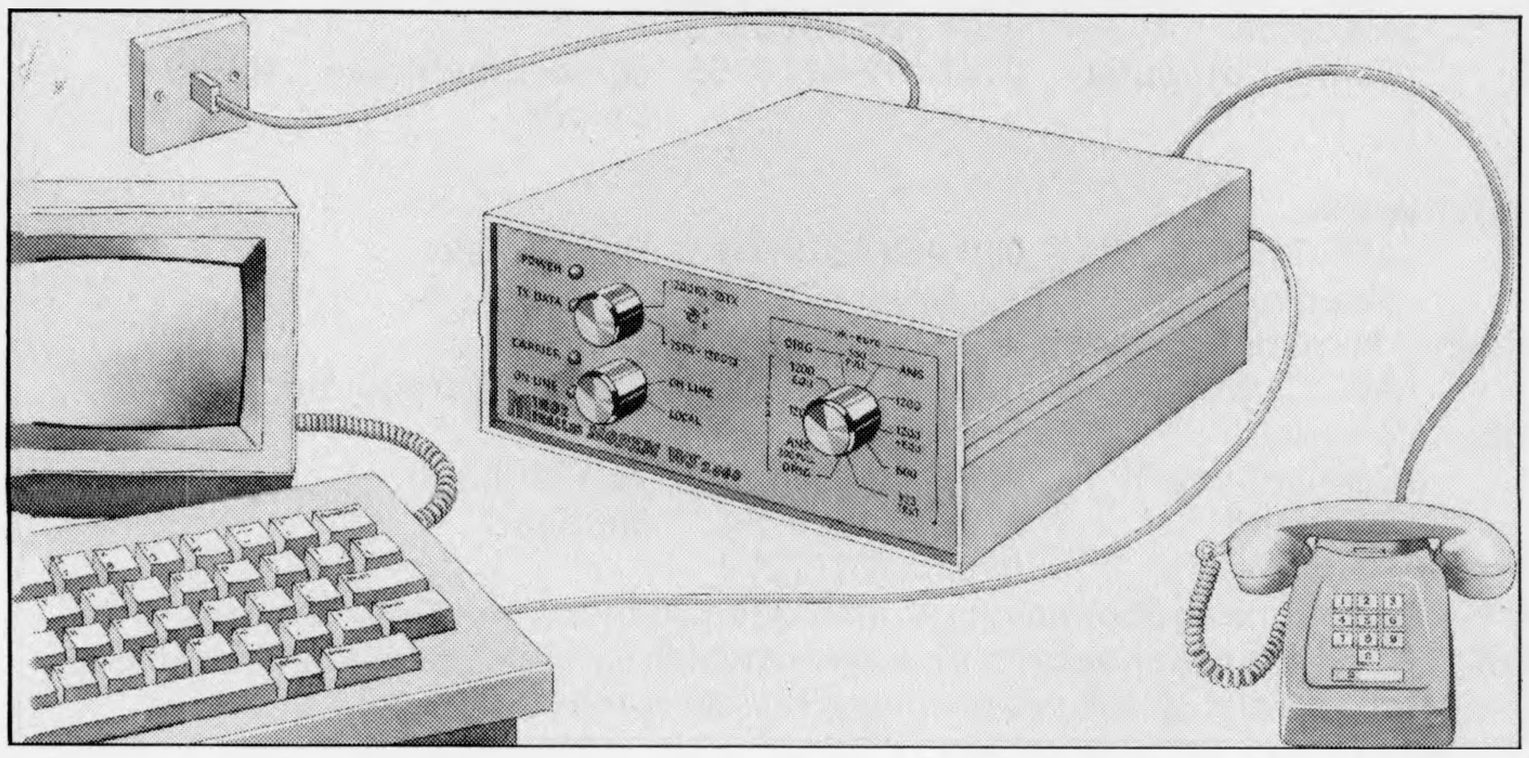
A variety of services are available to the micro user who has access to a modem and appropriate software. Some are within the Prestel system, such as Micronet 800 and Viewfax 258 while other commercial and hobbyist services exist outside it. The dilemma facing anyone thinking of buying a modem is that different standards exist for these services. Two are in general use on UK systems: one is the 300 bit/sec (CCITT V21) standard used by bulletin boards and many online systems, such as educational time-sharing computers; the other is the 1200/75 V23 standard, the main user being Prestel. V23 talks to you at 1200 bits/sec (120 characters/sec) and listens at 75 bits/sec. A further less common standard is the 1200 bit/sec full duplex V22 standard, but this is not yet popular.

In the US other standards are in use: chiefly the 300 bit/sec Bell 103, the 1200 bit/sec full duplex Bell 212 and the less common 1200 bit/sec half duplex Bell 202 standards. (See Network News, *PCW*, March for more information about these standards.)

Until recently, buying a modem for general use meant deciding which standard to go for. If you wanted to use both V21 and V23 you had to buy two modems, which not so long ago would have cost around £200 or more *each*.

However, things have been changing fast over the last year or so. There has been a considerable growth of interest in communications in both the business and hobby worlds and this, together with the development of micro technology, has lead integrated circuit manufacturers to produce modem chips that need fewer supporting components. For example, the MC14412 chip from Motorola is popular, being used for both V21 and Bell 103 modems (including the Maplin kit and the DaCom Buzzbox). Although it represents a big step forward in reducing component counts (and costs), it still needs a fair number of close tolerance external components to filter the signals. Also, it is not easy to make a complete modem that will switch between two modes due to the external filtering needed, although it is basically a dual standard device (providing both UK and US 300 bit/sec standards on one chip).

But we are now witnessing the appearance of a new generation of modem chips that need very few external components. One of these is the AM7910 from AMD. This chip has filtering built-in and needs only a handful of non-critical external components to make a fully-fledged modem: one that will handle a variety of different standards (see Fig 1). Modems using this chip are becoming available and the Minor Miracles WS2000 is one of them.



Initial impressions

The WS2000 is small and neat, measuring 15cm x 15cm x 6.25cm high and weighing only 1kg. It could in fact be considered a little too small, as the top is not large enough to stand a telephone on (the photo is not to scale!). The modem comes complete with a lead to connect it to the RS232 port of a BBC Micro (other types of lead are available for an extra £7). Various types of terminal software are also available, again at extra cost. The instructions include a listing of a short terminal program to enable the BBC Micro to be used as a dumb terminal with 300 bit/sec systems.

The case is BBC beige and solidly made from a tough dense nylon material. The front panel is black and has several controls: a main mode selector, an online/local switch, a V23 receive/transmit switch and a small toggle switch to allow software control of receive and transmit modes in V23 operation. It also has indicator LEDs for power, modem online, transmitted data and carrier detect. There is no LED to indicate that data is being received (some modems don't even have a transmitted data indicator). Apparently, a received data LED is to be incorporated in future models.

The rear panel carries the mains on/off switch, a six-pin DIN RS232 socket, and on the review model a telephone socket. There are also a couple of blanked-off holes ready for use with the auto answer and mode

select options. A mains cable and telephone cable carrying a new style telephone plug complete the equipment.

The case interior is very small and surprisingly empty: there are only a handful of components. These are carried on two PCBs: one horizontal and one vertical. The latter, which is the main PCB, plugs into the horizontal board. I discovered that it's possible, due to the flexibility of this PCB, to miss one of the plugs when plugging it in. This, not surprisingly, prevents the modem from working. There is a space in the middle of the horizontal PCB for the optional auto answer board. Only the modem chip is socketted, but the layout and modular construction make everything accessible so repairs should be straightforward. The WS2000 is guaranteed for 12 months, except that some components are 'guaranteed only for the period offered by their original manufacturer if this is less than 12 months.'

Overall, the modem is well made and gives the feeling of solidity and good quality.

Setting up

Initial setting up of the WS2000 is fairly straightforward in its simpler modes. There are various internal links that can be altered to suit special requirements, but most users will not need to change them from the original settings. They enable external control using Data Terminal Ready (DTR) and Ready To Send (RTS), and will only be required for more specialised applications. However, it's good to see that facilities have been provided for such applications, which should give the WS2000 an entry into the professional data comms market.

To use the modem, connect it to a telephone point using the lead supplied. Until it becomes legal to sell modems with a socket in the back into which to plug the telephone, you will need a two-way adaptor to enable you to use the modem and telephone together (see Network News for more details). The WS3000 comes equipped with the proper socket installed on the modem.

The next step is to connect the modem to the RS232 outlet of your computer using the appropriate lead and to load your terminal software. Select the required mode by means of the front panel switches, which will probably be 300 bit/sec originate in the UK section for your first trials.

Finally, make sure the line switch is set to 'off line'. In this position the modem automatically goes into 'test mode' and echoes back all characters it receives to your computer. This is a useful feature as it enables you to make sure that everything is working properly before you start treading the bulletin boards for real. The instructions guide you through this stage fairly well, but a bit more information on what to do if problems occur would be helpful (the manufacturer claims that the instructions are being rewritten and will include more information of this sort).

Once set up, the WS2000 is easy to use: simply dial the number of the system you want to talk to, and on hearing the answering modem's tone turn the 'LOCAL/ONLINE' switch to 'ONLINE'. At this stage, the ONLINE and CARRIER indicators should light. If the former does and the latter does not, then you may have been a bit slow switching online and the computer at the other end has hung up, or you may have the wrong mode for the system being called, so check that you have the correct settings. The CARRIER light is not a totally reliable guide to this, as there is often sufficient overlap in the carrier frequencies to enable the carrier lock to come on even if the wrong mode has been selected.

Selecting the required mode is rather complex at first. It's not too bad once you get the hang of it except that with Prestel-type systems there are several options available, but the instructions guide you through the process fairly well. It is also possible, with an extra connecting cable, to change modes under software control from your computer, but to do this the hardware has to switch three or four lines on and off. Again, BBC users are well supported with an optional cable to connect to the user port. Users of other makes of computer will probably need to decode a port if they wish to do this.

Although I wasn't able to try some of the more esoteric modes, I found the WS2000 worked reliably with hardly any errors — even when calling the US. You just switch online and forget about it, unless you are running in half duplex mode at 1200 bits/sec and exchanging files with a friend. In this case, the modem has to be switched from transmit to receive each time the conversation changes sides, which is like saying 'over' when you have finished talking on a CB system and you are ready to receive an answer. If you have the right software this can be done automatically, as the WS2000 will change modes on receipt of the appropriate signal from your computer.

Auto answer board

One of the promised options is an auto answer/auto dial board which will enable the user to dial the number of the system to be called automatically, and also allow the modem to answer the phone in his absence. The latter function is the system used by bulletin boards, but it could be useful if you wanted someone to call and leave a message, or upload a program when you weren't able to be there in person. Suitable software is required, but that shouldn't be too hard to obtain, or to write yourself.

Other options

Minor Miracles has several other options available, including software for various systems and the software mode control cable for the BBC Micro. Minor Miracles also supplies alternative RS232 cables for any make of computer at an extra charge of £7.

The WS2000 is also available in card form and a plug-in modem card for the Apple is in preparation. RS232 interfaces are available for several popular micros.

Prices

At the moment the WS2000 is only available by mail order from Minor Miracles, at an introductory price of £99.95 plus VAT and carriage (£118 total). It will shortly be available through retail outlets at a price of £129.95 plus VAT (£149.44).

Conclusions

Multi-mode modems are a very exciting development, enabling the micro user to have access to the full range of systems available via the telephone system. It is no longer necessary to choose between 300 and 1200/72 standards or to buy two modems: you can have both in one package and at a reasonable price. The major drawback of the WS2000 is that it is not yet approved for connection to British Telecom lines, but Minor Miracles is hoping to obtain this approval shortly.

The WS2000 is by no means the only multi-mode modem available, nor is it the first, but it is the cheapest around at the present time, and if and when it gets its 'approved' sticker it will be strong competition indeed for other modems costing two or three times its £100 price tag.

A very versatile device, representing good value for money.

END

UK (CCITT) standards			
V21		300/300	Full duplex : originate/answer
V23	Mode 1	600/75	Half duplex : originate/answer
V23	Mode 2	1200/75	Half duplex : originate/answer
V23	Mode 2	equalised	(as above, but for bad lines)
US (Bell) standards			
Bell 103		300/300	Full duplex : originate/answer
Bell 202		1200	Half duplex : originate/answer
Bell 202		equalised	(as above, but for bad lines)

Fig 1 Table of modes

DATA LINK 32



Printer Buffer ? YES
Store and Forward ? YES
Terminal ? YES

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Typical configurations may include:
300 baud answer originate modem (£59 Excl.), 300/1200/75 baud prestel compatable modem (£99.95 Excl.), RS232 Keyboard (£89 Excl.) Matrix printer 80 cps (£225 Excl.).

*PRINTER BUFFER

The DATALINK 32 used as a printer buffer has a host of excellent features - **Status** and activity display giving a graphic and numeric indication of the buffer area used and free, **Backspace line** - for paper foul or ribbon fail, **Advance line** - to skip over unwanted sections, together with all the usual buffer control commands - **COPY PAUSE/RESUME CLEAR** - and even **error checking** for remote stations.

*KEYBOARD SEND AND RECEIVE TERMINAL

When used with an optional keyboard the DATALINK 32 becomes a remote terminal with a 32K non-volatile memory and a two line Liquid Crystal Display.

*MESSAGE STORE AND FORWARD SYSTEM

The DATALINK 32 is capable of providing error free office to office or around the world message transfer. Unattended operation is possible when used with an auto answer modem. Binary program files may also be stored and retrieved at the touch of a button.

*POWERFUL TEXT EDITOR

A very useful wordstar like editor is available on the DATALINK 32 for the preparation, alteration or correction of messages or letters ready for printing or transmission.

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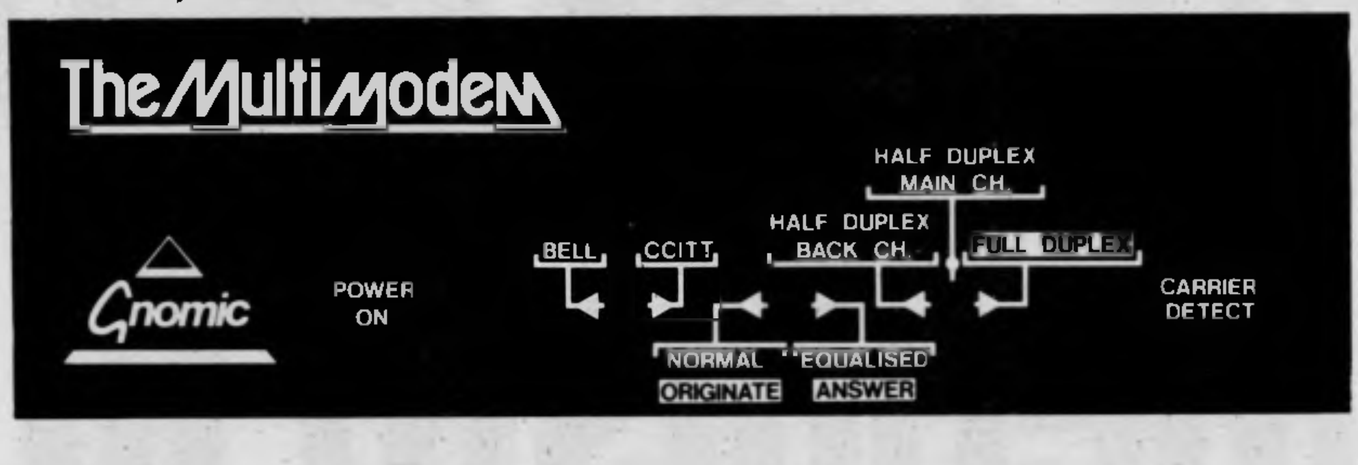

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Designed and manufactured by ourselves, the Multimodem provides the answer for the user who wants 300/1200 baud. Prestel, CCITT and Bell standards all in one neat box. The Multimodem can open up a new and interesting world of communications with your computer.

SPECIFICATIONS

TRANSMITTER
Input data format — Serial, asynchronous RS232
Modulation — Frequency Shift Keying (FSK)
TC Output level −3dBm into 600 ohm.

RECEIVER
Output data format — Serial, asynchronous, RS232
Demodulation — Differential FM detection.
Sensitivity — 0dBm to −48dBm.
Frequency deviation tolerance — +/−16Hz.
Carrier detect threshold — ON >−43dBm +/−1dB
OFF <−48dBm +/−1dB

INPUT/OUTPUT

INPUT/OUTPUT TO LINE
Connections — 5 pin DIN socket
Impedance — 600 Ohms
INPUT/OUTPUT TO COMPUTER
Connections — 25 way "D" socket
Data in, Data out
Clear to send, Ready to send
Carrier detect
POWER REQUIREMENTS
240V AC Mains — 2M cable with 13A plug fitted.
REAR PANEL
Line in/out (5 pin DIN) — RS232 (25 way D) — Mains on/off — Fuse (1A)
FRONT PANEL
Power on indicator — Carrier detect indicator
Bell / CCITT switch — Originate/Answer, Normal/Equalised switch
Full duplex / Half duplex main / Half duplex back switch
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The computer software for the game is to be designed via a London-wide competition which is open to all *non-commercial* entrants. Software for BBC Model B or Sinclair Spectrum computers will be accepted. The judges for the competition will be GLC members. All entries must be received no later than 8 June 1984.

For further information including a complete set of instructions plus the game's specifications, please phone: Pam Nanda, Ethnic Minorities Unit, 633 4273 or Patricia Devine, Central Computing Services, 633 3348; or write to: COMPUTER GAME COMPETITION Greater London Council, Director-General's Department (DG/EMU), Room 686, County Hall, London SE1 7PB.

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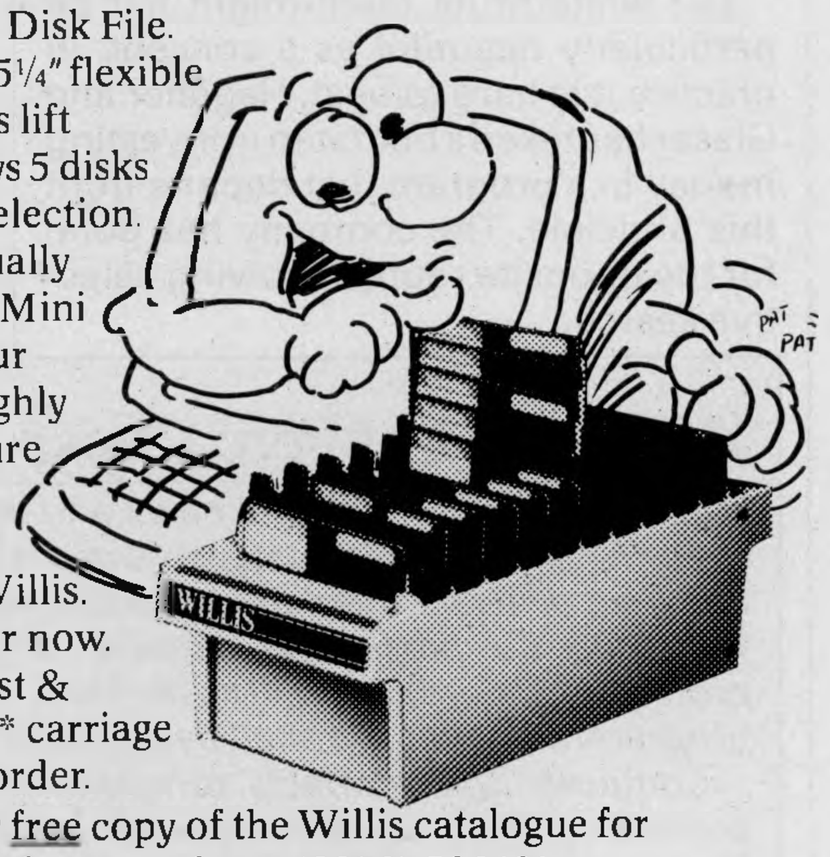

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PCW211



Mephisto III

Tony Harrington reports on an 'intuitive' new chess program from Hegener and Glaser.

Micro Chess readers might remember how, as reported a year ago in this column, Ossie Weiner (then with the German chess machine supplier Hegener and Glaser) told me of the breakthrough the company had made. A new chess program was on the way which would play 'intuitively', like a player. That program, the Mephisto III, is now available.

The major difference between the Mephisto III and the earlier Mephisto II is that, with the former, Hegener and Glaser has abandoned the tried and trusted concept of 'brute force' in chess programming. Brute force describes a programming strategy where the program simply crunches through all possible moves looking for the best line.

There are, of course, some cute programming tricks — like the Alpha Beta cut off — which eliminate some of the more unnecessary position crunching. But, by and large, the brute force approach looks at everything, even the most stupid and irrelevant moves. It is a wasteful approach and not particularly elegant.

But while brute force might not be particularly beautiful as a concept, in practice it is hard to beat. Hegener and Glaser has taken a bold step in investing money in a program that departs from this principle. The company has gone for the opposite route, involving selective search.

The Mephisto III program crunches through every possible move for the first two plies (one ply being a single white or black move), then it switches to consider in depth only a handful of really promising lines.

It also attempts to distinguish between tactical positions (where there is a great deal going on in the way of possible captures, sacrifices, mating attacks and so forth) and quiet positions. Chess computers are notoriously bad at quiet positions. Instead of using such positions to develop a long-term game plan, they tend to shuffle their rooks backwards and forwards and wait for their opponent to do something interesting.

Developing a program that is good at quiet positions sounds fine in theory. But in practice it is very hard to achieve. The route from the drawing board to the shop shelves has not been without its hitches. At last year's *PCW* tournament great things were expected of the Mephisto III; but it failed miserably in a couple of games, in positions where its predecessor, the Mephisto II, could have been expected to win handsomely.

I well remember one chess computer expert saying what a shame it was that such a bold new innovation in programming had failed.

As things turned out, that comment was decidedly premature. The World Microcomputer Championships, held in Budapest only a week or so after the *PCW* tournament, found the Mephisto III in better shape. Whereas it could only manage ninth place at the *PCW* tournament, in Budapest it managed to fight its way into a three-way tie for second place, with five out of a possible seven points.

The word from Hegener and Glaser was that the poor showing at the *PCW* tournament was the result of an attempted 'improvement' to the program, made a day or two before the tournament began. This modification turned out to cause more problems than it cured. The programmer, Thomas Nietzsche, worked flat out to cure the bugs and Budapest showed that his efforts were not in vain.

Then an experimental version of the Mephisto III went to New York to play in the 4th World Computer Chess Championships, against the likes of Belle and the Cray Blitz. According to Hegener and Glaser, the only difference between the experimental entry and the standard Mephisto III lay in the hardware. Instead of running on the standard 8MHz board, the experimental version ran on a souped-up, 16MHz machine. It did exceptionally well, finishing up in a three-way tie for sixth place with three out of five points.

Despite these good tournament results, even Hegener and Glaser cannot claim that the Mephisto III is definitely stronger than the old Mephisto II. The most the company would claim was that it played a totally different game. 'It has a very "human" style', a spokesman said.

It is definitely in the same bracket as far as both strength and price is concerned, as the Novag Constellation and SciSys's Superstar. Unfortunately, although it has most of the features one expects from a commercial chess computer, it still uses the overly complicated multiple-key approach of the Mephisto II in order to access these functions.

Hegener and Glaser expects great things from its new brainchild. Sales in excess of $5 million are predicted world-wide through 1984.

Welcome to Micro Chess

Micro Chess covers all the news and events in the busy world of computer chess. With new chess programs and new chess computers appearing all the time, we evaluate their strengths and weaknesses as they become available. We shall be presenting profiles of programmers, both amateurs and professionals, which will cover their methods and their interest in chess programming, and we shall be talking to suppliers and looking at their plans.

Computer Chess affects computer enthusiasts in two different ways. For some, the fact that they can now play chess against either their home computer or a dedicated chess computer has opened up the delights of the game. For others, the real interest is not so much in playing chess as in trying to build a chess program. Micro Chess aims to meet the interests of both.

Chess is a game that can be as exciting for the beginner as it is for the grand master. So if you haven't played before, get yourself a good introduction to the game — there are dozens in the bookshops — and get to it.

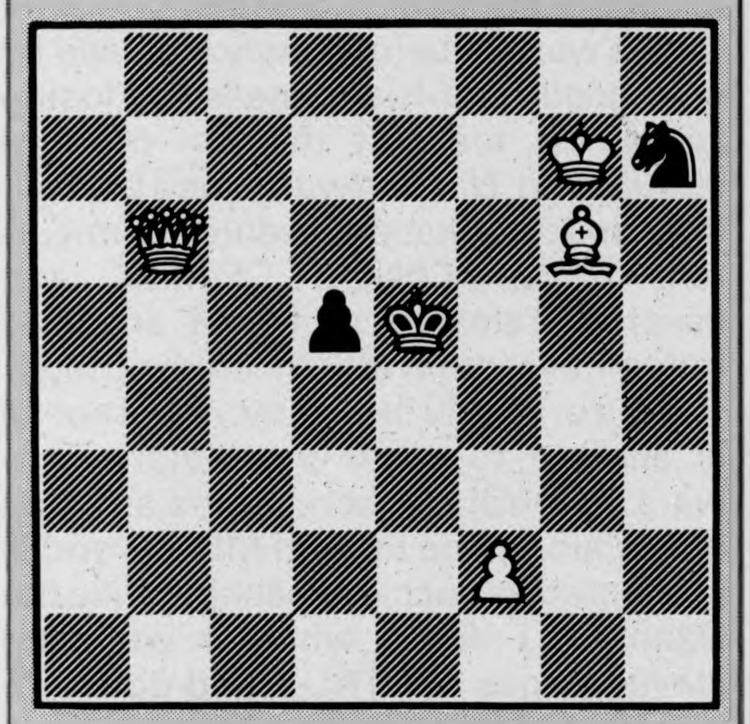
Problem composition

John Nunn looks at problem composition on a BBC Model B.

Chess problems are composed positions in which White to play can force mate in a specified number of moves.

Unlike over-the-board play, in which computers cannot yet compete with the top players, a good machine can defeat the best human problem-solver. Many commercial machines and personal computer programs have a special problem mode which takes advantage of the fact that the search depth is known in advance. After the position has been entered and the number of moves set, the machine can be left to 'think' until a solution is found. It is very useful to be able to restart the machine to see if there are any additional solutions not intended by the composer. Should one exist the problem is ruined. Much of the composer's time is spent checking that his intended solution is unique and a machine can greatly speed up this tedious process.

I composed the following problem with the aid of a BBC Model B and the White Knight Mk II program.



White to play and mate in three

This was published in *British Chess* (January, 1984). If you would like to compare the speed of White Knight with your own machine, it took 19secs to solve this problem and a further 26secs to check that there were no other solutions.

Although White Knight is very fast, it is not able to consider under-promotions in its analysis, so will give erratic results with any problems depending on under-promotions. This may be the case even if no under-promotion occurs in the solution, since Black may have to under-promote to counter a faulty attempt by White. Should this happen the computer will erroneously report that there is more than one solution. Many problems do in fact rely on under-promotions, so this is a significant defect. It must be added that there is little consistency on this matter among chess machines and programs. Some only consider promotions to queen and knight, others only consider under-promotions on the first move. If you intend using a machine for problem solving or composing, it is worth bearing this point in mind.

Pocket chess

SciSys has recently introduced an interesting pocket chess computer called the Explorer. This runs off three penlight batteries. The game below illustrates the limitations of the Explorer rather well.

Player vs Explorer: 1 e4 d5 2 exd Qxd 3 Nc3 Qa5 4 d4 Nf6 5 Nf3 Be6 (Explorer has a habit of playing moves like this with its Bishops once it gets out of its tiny openings library. It's after the pawn on a2, which is not only a shallow, half-baked plan, but also plays havoc with the development of its King-side by trapping its King's Bishop. The point now is how best to take advantage of the move). 6 Bd2 Nc6 7Bb5 0-0-0 (not exactly a brilliant move, either, but great fun to play against) 8 BxN bxB 9 Ne4 (played solely in order to lure the Queen into a position where it would go pawn hunting) Qb5 10 Nc3 Qxb (and the bait is taken) 11 Rb1 Qa3 12 0-0 Bxa (take one, take all) 13 NxB QxN 14 Qe2 e6 15 Ne5 Rxd 16 Ra1 Qxc2 (the pawn hunt goes on) 17 Qa6+ Kd8 18 Nxc6+ Kd7 19 NxR QxB 20 Rfd1 Qb2 21 Qc6+ Kc8 22 Rxa Kd8 23 Qxc+ Ke8 24 Qc8 checkmate.

Games section

White: Mephisto X. Black: Ostrich. New York Chess Championships 1983. Centre Counter Game. Notes by David Levy.

1	e2-e4	d7-d5
2	e4xd5	Ng8-f6
3	d2-d4	Nf6xd5
4	c2-c4	Nd5-b6
5	Ng1-f3	Bc8-g4
6	Bf1-e2	

(6c4-c5 Nb6-d5 7 Qd1-b3 is a more aggressive idea.)

6	...	Nb8-c6
7	d4-d5	Bg4xf3
8	Be2xf3	Nc6-e5
9	b2-b3	

(9 Bf3-e2 is met by 9...c7-c6, and not 9...Ne5xc4?? 10 Be2xc4 Nb6xc4 11 Qd1-a4+, winning a piece.)

9	...	g7-g6
10	Bc1-b2	Bf8-g7
11	Nb1-c3	

(Not 11 Bf3-e2? because of 11...Ne5-f3+! and 12...Bg7xb2, trapping the rook in the corner.)

11	...	0-0?

(Black should trade on f3, since the White bishop is a better long-term prospect than the Black knight.)

12	Bf3-e2	Ne5-d7
13	f2-f4	Bg7xc3+?
14	Bb2xc3	a7-a5
15	Qd1-d2	a5-a4
16	0-0	a4xb3
17	a2xb3	Ra8xa1
18	Rf1xa1	

(White has a big advantage. In addition to the long-term plus of the two bishops for two knights, which bodes well for the endgame, White also dominates the a-file and has chances of an attack against the vulnerable Black King.)

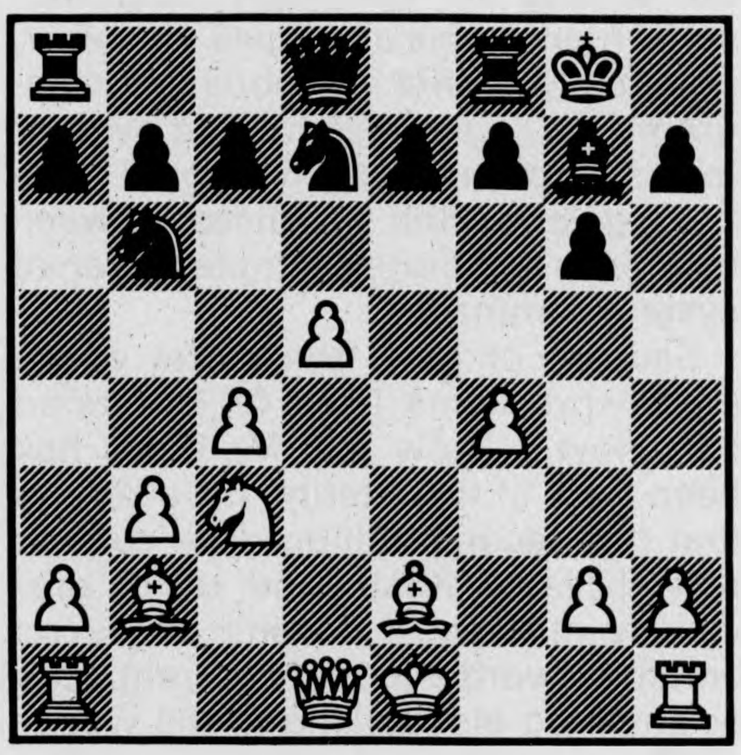
18	...	Rf8-e8
19	Qd2-b2	e7-e6
20	d5xe6	Re8xe6
21	Ra1-a7	Qd8-b8
22	Ra7-a5	Re6-e4
23	Be2-f3	Re4-e3
24	Qb2-d2	Re3-e7
25	Qd2-d4	

(Threatening mate, thereby compelling Black to weaken its K-side still further. In fact this move is the start of a long-forcing sequence which wins material, but it is difficult to tell at what point White saw that the win was inevitable.)

25	...	f7-f6
26	c4-c5	Nb6-c8
27	Bf3-g4	b7-b6
28	Qd4-d5+	Kg8-g7
29	Ra5-a8	c7-c6
30	Ra8xb8	c6xd5
31	Bg4xd7	Re7xd7
32	Rb8xc8	b6xc5
33	Rc8xc5	d5-d4
34	Bc3-d2	d4-d3

(White has an easily won position, and apart from observing the accuracy with which Mephisto plays the remainder of the game there is little real chess interest in the concluding moves.)

35	Kg1-f2	Rd7-e7
36	Kf2-f3	Re7-e2
37	Bd2-c1	Re2-a2
38	Rc5-c7+	Kg7-g8
39	Rc7-d7	Ra2-c2
40	Bc1-e3	Rc2-c3
41	Be3-d4	Rc3xb3
42	Bd4xf6	Rb3-a3
43	Bf6-e5	d3-d2+
44	Kf3-e2	d2-d1=Q+
45	Rd7xd1	h7-h5
46	Rd1-d6	Ra3-a2+
47	Ke2-f1	Kg8-f7
48	h2-h4	Ra2-c2
49	Rd6-f6+	Kf7-e7
50	Rf6xg6	Ke7-f7 and Black Resigned



Position after White's 13th move

BIBLIOFILE

This month Linnet Evans lays bare the soul of CP/M and gets down to the business of VisiCalc and financial modelling.



CP/M Primer (2nd edition)

Author: Stephen Murtha & Mitchell Waite
Publisher: Howard W Sams & Co
Price: $16.95

Once upon a time, when we were raw and user groups hadn't been invented — nor had CP/M user areas — this ilk of publication was veritable manna from heaven. Alas, the classics such as Rodney Zaks' *CP/M Handbook* (which kept me and mine in the manna to which . . .) now seem just that shade dragging and pedantic. Recent titles such as *CP/M — The Software Bus* reviewed alongside show how much further and more elegantly one set of covers can take the novice-to-middling reader today. *CP/M Primer* makes no heavy pretences. It's a straight all-American fun/serious whistle-stop trip around SYSGEN and PIP. Elements of the writing are startlingly lucid with some memorable analogies. However, potentially useful cartoons and diagrams are sometimes marred by poor layout. More regard, too, could have been given to the variances between machines and more examples given of system commands.

Saddest of all is the jacket which merrily proclaims 'latest CP/M Version 2.0'. Now, I know that Mr Waite has been busy in the interim. It's also true that this second edition does contain references to XSUB and USER previously missing. It doesn't, however, breathe a word about Concurrent, Plus or anything else lurking in the woodwork.

The *CP/M Primer* is a slender but tightly-packed volume. It was invaluable in its time, and I suppose one can forgive the publishers for trying out a little light recycling today. It does indeed remain very readable, but compared to its heftier younger brothers it's like matching a KIM to a VIC.

CP/M — The Software Bus

Author: Andrew Clarke, Mike Eaton and David Powys-Lybbe
Publisher: Sigma Technical Press
Price: £8.95

CP/M — The Software Bus is subtitled 'a programmer's companion'. The book operates usefully and credibly at several levels, though the authors' roots in the UK CP/M User Group no doubt give it that special mellow tang.

At ground floor level, the book provides a mainstream introduction to system commands in a clear if rather terse way that matches most others of the genre.

Secondly, it offers a mass of information on CP/M manipulation for the systems programmer. The final chapter carries some particularly neat (and copyright) bug-fixes and patches from Digital Research.

Lastly, though version 2.2 of CP/M remains the primary yardstick (and version 1.4 hasn't been forgotten!), *The Software Bus* gives a full and fulfilling rundown of release 3.0 — otherwise CP/M Plus. Features and differences are noted carefully and in context. The constant crosstalk between the established and the incoming releases is probably the book's greatest strength. Those wary of being newly seduced by enhanced user-friendliness (or losing some old mats at the A> prompt) should find *The Software Bus* a particularly good sightseeing vehicle. Concurrent CP/M, CPNET, CP/M-86 and assorted releases of MP/M are duly noted but remain strictly on the fringe.

A surprisingly large amount of space is allotted to other proprietary software. WordStar is considered as a text editor alongside ED and MBasic and is presented as such on machines like the Osborne. I doubt whether we need eleven pages of CTRL-K and dot commands, but so be it. Another chapter is given to summarising the main high-level languages supported by CP/M micros — multiple Basics and Algols, CIS Cobol, Pascal-MT, and so on. General workings are described and functions/facilities listed without getting entangled in any comparative merits. Thankfully, the spread of compatible assemblers — quite bewildering for the newcomer — gets as thorough a treatment.

If *CP/M — The Software Bus* has a fault, it's that it tries to be too much to too many, although it does handle the major facts of life with authority, enthusiasm and dignity. Very commendable transport.

Soul of CP/M

Author: Mitchell Waite & Robert Lafore
Publisher: Howard W Sams & Co
Price: £16.10

Most books with *CP/M* in the title,

including the pair reviewed here and the complementary *CP/M Bible*, deal with the operating system at operator level and the odd BDOS call. That's the main body of CP/M titles: the *Soul* is definitely between the buttons, below the belt or somewhere else.

In best Waite style, the approach is never off the record but usually off the wall. The first chapters are effectively a straight-no-chaser intro to 8080 assembler, initially using DDT rather than ASM. A handful of inflatable 'Mickey Mouse' programs are used to illustrate given functions: you type, you run and the explanations follow hotfoot along with the run-time mishaps! Lots of diagrams are used to give excellent clarification for memory addressing, bit rotation *et al*, together with timely flowcharts.

The second group looks principally at system calls using the file control buffer. While this is clearly the task in hand, many readers will probably get a special buzz from realising what can't be handled in most high level scripts (logging into alternate drives, for example). Even more attention could have been given later to mixing assembler routines into primary Basic programs. However, the 'knowledge' of fixing back a recently ERAsed file into the directory will doubtless appease the gods.

The final chapters — thin ice if you want it — look at patching BIOS for 'non-native' peripherals. The book winds up with general summaries of 8080 instruction sets, various conversion tables and additional routine listings. In parentheses, a future edition might provide Z80 users with more explicit assurance of where any bucks are likely to stop.

Soul of CP/M is no textbook, nor was it meant to be, but it does provide a (usually) thoroughly practical and realistic path to self-determination on CP/M micros. Nice one.

Financial Modelling on a Microcomputer

Author: Max Dobres
Publisher: Sigma Technical Press
Price: £7.50

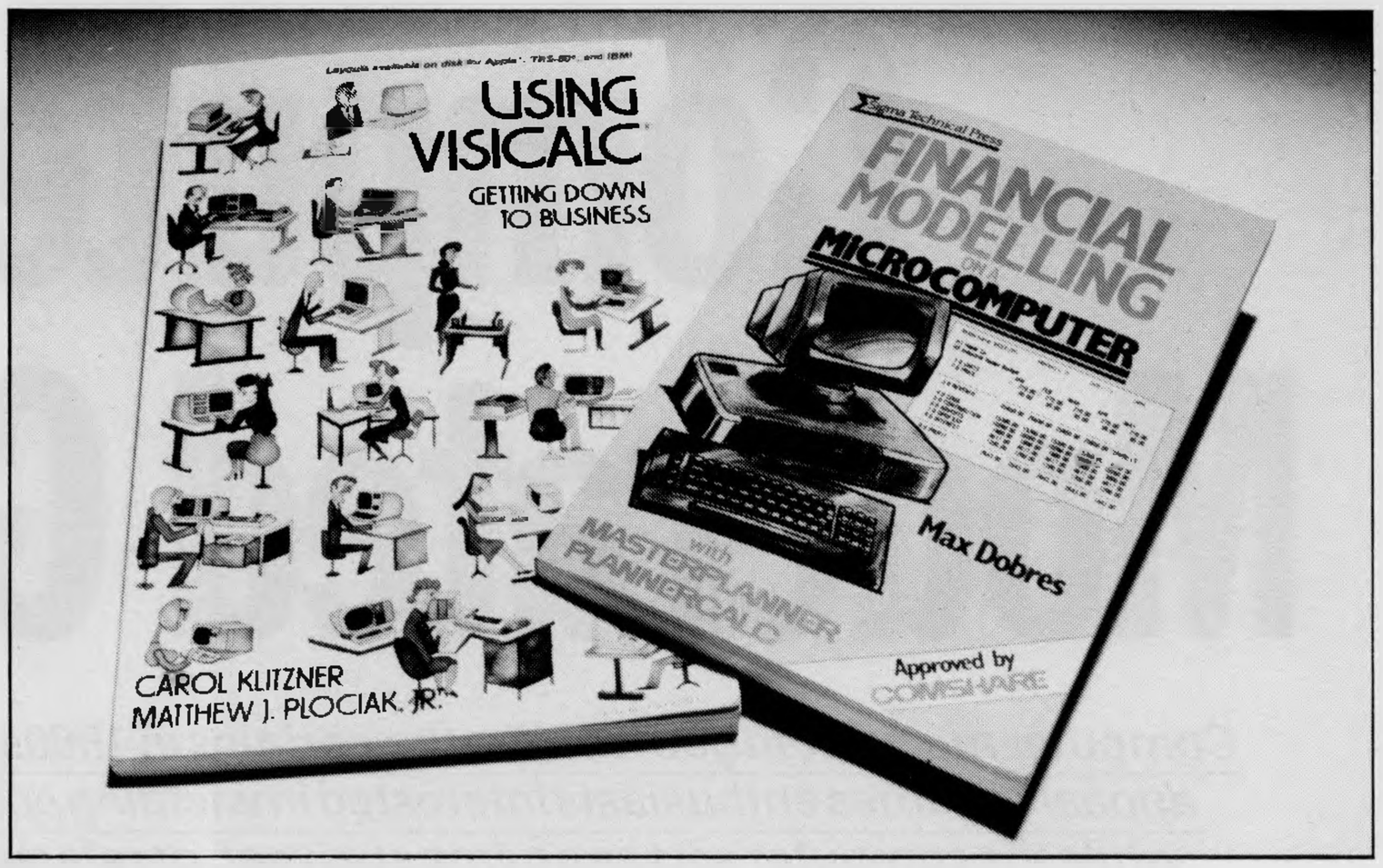
The subtitle here is '. . . with Masterplanner and PlannerCalc'. The latter, in particular, is now widely available for CP/M, CP/M-86 and MS-DOS machines, and at £85 is among the very cheapest of the spreadsheets. Importantly, and unusually, it's upgradable to the more powerful Masterplanner.

Mr Dobres is, as it happens, marketing manager of publishers Comshare, as a result of which, no doubt, the word 'spreadsheet' is never used except for the piece of squared paper. However, it probably doesn't require the end-user's detachment to recognise that, for once, the official PlannerCalc manual is actually very good and as such doesn't demand the usual flurry of documentational superclones as VisiCalc, for instance, has done.

Financial Modelling is not in that vein, however. The book is there firstly to answer the questions: 'What is a spreadsh . . . sorry, financial modeller?', 'How can it help me?', and so forth. PlannerCalc, and later on Masterplanner, are used as a means of illustrating some of the answers — and bully for any extra branded software sold. A certain amount of space is certainly taken to sell modelling *per se;* readers will probably appreciate more examples of application at this stage rather than occasionally stumbling on them unawares in the hands-on chapters. While Max Dobres is firmly pitching his message to 'businessmen', a more relaxed and energetic tack wouldn't have been unwelcome at any point. Layout and illustrations are adequate but there is scope for improvement.

With its relative brevity and starkness, *Financial Modelling* does give workable answers to the 'What is . . .' questions, if not to the inner sanctums of the 'What if . . .' strata. Outline knowledge of the Comshare packages' capabilities might be a good backdrop before a shopping trip or round of exhibition stands. At other levels, the book simply shortfalls the original user documentation.

Worthwhile questions, certainly, but not altogether a model answer.



Using VisiCalc: Getting Down to Business

Author: Carol Klitzner & Matthew J Plociak Jr
Publisher: Wiley Press
Price: £13.95

If *Financial Modelling* was squeaky chalk, then *Using VisiCalc* is low-fat cheese. In just five years, Visicorp's radical software chic (or cheek?) has spawned dozens of clones and counter-clones, sold 20,000 Apples and found itself somewhat beached on the rocks for its pains. It remains nonetheless a household name, the Hoover of spreadsheets. The authors of this present book have responded accordingly.

They blame, and with some justification, the under-use of VisiCalc facilities to rigid user documentation, hence the undervaluing of the package. Considerably more space is given to screen workings than was allowed in the Sigma book and at a pace and style suited to the average keyboard hacker. The rather greater range of bells and whistles available with VisiCalc — Boolean functions, for instance — partly force this approach. Another factor is that Klitzner and Plociak go for US gold and show the precise operations of the package on Apple II, TRS-80 Model III and IBM PC boxed separately.

Although committed to the one branded product, *Using VisiCalc* makes a far better job of attempting to be generalised. The introductory chapter also takes care to point out where any financial mod . . . sorry, spreadsheet shouldn't be used at all (full-blown accounting works) and where a package of this type is likely in practice to be a pain in the neck.

Closing chapters are given to a summary of the elusive Advanced Version, a cheerfully uncritical look at the transfer facility DIF and listings for some of the screen routines shown in the main body of the book. (The latter is also available in the United States on floppy disk.)

A useful reference book. END

Computer Moderated Games

Computer moderated games have their origins in 1960s postal hobbies and will appeal to games enthusiasts interested in wielding complete tactical power while the computer acts as a game analyser, or referee. Tony Hetherington blows the whistle on one such game—football management.

```
  10 REM Superleaque CMG
  20 LET w$="GDMF"
  30 DIM w(20,4): DIM f$(18,20):
 DIM y(5,8): DIM v$(33,9): DIM p
$(10,34): DIM a$(10,173): DIM c(
10)
  40 FOR n=1 TO 5: FOR m=1 TO 8:
 READ y(n,m): NEXT m: NEXT n
  50 FOR n=1 TO 20: READ w(n,1),
w(n,2),w(n,3),w(n,4): NEXT n
  60 FOR n=1 TO 18: READ f$(n):
NEXT n
  70 FOR n=1 TO 33: READ v$(n):
NEXT n
  80 FOR n=1 TO 10: READ p$(n):
NEXT n
  90 READ Orders,Process,Report,
OK,input,validate,assign,error,T
actics,Incidents,training,update
files,transfer,sort,print
 100 DIM l$(26,7): FOR n=1 TO 26
: LET l$(n)=w$(INT (RND*3)+1)+CH
R$ (INT (RND*9)+65)+CHR$ (INT (R
ND*9)+75)+"POOy": NEXT n
 110 FOR n=1 TO 10: LET c(n)=100
0000: NEXT n
 120 GO TO 3550
 130 REM weekly routine
 140 FOR w=1 TO 18: LET week=w
 180 REM save game
 190 CLS : PRINT "Position a bla
nk cassette ready   to save the
game."
 200 PRINT : PRINT "press any ke
y when ready": PAUSE 0
 210 CLS : PRINT AT 10,10;"SAVIN
G SUPERLEAGUE"
 220 SAVE "SL" LINE 282
 230 CLS : PRINT "Rewind tape to
 verify saving."
 240 PRINT : PRINT "press any ke
y when ready": PAUSE 0
 250 VERIFY ""
 260 GO SUB OK
 270 IF INKEY$="n" THEN GO TO 19
0
 280 STOP
 282 GO SUB Orders
 284 CLS : PRINT "Processing Ord
ers": GO SUB process
 286 GO SUB Report
 290 NEXT w
 300 REM Input orders routine
 310 REM
 320 REM Accepts and validates
 330 REM orders for each team.
 340 REM
 350 REM --------------------
 360 DIM s(10): DIM t(20,2): DIM
 b$(10,22): DIM c$(10,6): DIM r$
(10,1): DIM t$(10,1): DIM g(10):
 DIM d(10): DIM m(10): DIM f(10)
 370 FOR t=1 TO 10
 380 PAPER 0: INK 7: BORDER 0: C
LS
 390 FOR n=1 TO 10
 400 PRINT AT (CODE p$(n,1))-65,
(CODE p$(n,2))-65;p$(n,3 TO )
 410 NEXT n
 420 PRINT AT 3,17;a$(t,1 TO 10)
 430 FOR n=1 TO 4: PRINT AT 5+n,
21;w$(n): NEXT n
 440 LET err=0: LET trp=1: LET v
=1
 450 IF v$(v,1 TO 3)="eof" THEN
GO TO 580
 455 LET vs=v
 460 LET ix=(CODE (v$(v,1)))-64
 470 LET iy=(CODE (v$(v,2)))-64
 480 IF v$(v,9)<>"$" THEN GO TO
520
 490 INPUT "Enter offer ";bid
 500 PRINT AT ix,iy;bid
 510 LET trp=trp+1
 512 LET t((t*2)-2+trp,2)=bid
 514 LET v=v+1: GO TO 450
 520 GO SUB input
 530 GO SUB validate
 540 IF vret=1 THEN GO SUB error
: GO TO 450
 550 GO SUB assign
 552 IF err=1 THEN GO SUB error:
 LET err=0: LET v=1: GO TO 450
 555 IF v$(v,8)="$" THEN LET v=v
1
 560 IF v$(vS,8)<>"$" THEN LET v
=(CODE (v$(v,8)))-64
 570 GO TO 450
 580 NEXT t
 590 RETURN
 600 REM Input subroutine
 610 REM
 620 REM ----------------------
 630 LET i$=""
 640 FLASH 1: PRINT AT ix,iy;" "
: FLASH 0
 650 IF INKEY$<>"" THEN GO TO 65
0
 660 IF INKEY$="" THEN GO TO 660
 670 LET i$=INKEY$
 680 PRINT AT ix,iy;i$
 690 RETURN
 700 REM validate subroutine
 710 REM
 720 REM ----------------------
 730 IF v$(v,3)="0" THEN GO TO 7
80
 740 IF CODE i$>=CODE (v$(v,4))
AND CODE (i$)<=CODE (v$(v,5)) TH
EN LET vret=0: GO TO 770
 750 IF i$>=v$(v,6) AND i$<=v$(v
,7) THEN LET vret=0: GO TO 770
 760 LET vret=1
 770 RETURN
 780 IF i$=v$(v,4) THEN LET vret
=0: GO TO 830
 790 IF i$=v$(v,5) THEN LET vret
=0: GO TO 830
 800 IF i$=v$(v,6) THEN LET vret
=0: GO TO 830
 810 IF i$=v$(v,7) THEN LET vret
=0: GO TO 830
 820 LET vret=1
 830 RETURN
 840 REM OK subroutine
 850 REM
 860 REM ----------------------
 870 IF INKEY$="" THEN GO TO 870
 880 IF INKEY$<>"" THEN GO TO 88
0
 890 IF INKEY$="y" THEN RETURN
 900 IF INKEY$="n" THEN RETURN
 910 GO TO 870
 920 REM Error routine
 930 REM
 940 REM ----------------------
 950 FOR n=7 TO 0 STEP -1
 960 BEEP .02,.02
 970 BORDER n
 980 NEXT n
 990 RETURN
1000 REM
1010 REM Assign routine
1020 GO TO 1020+(CODE (v$(v,9))-
64)*10
1030 LET d=VAL i$: RETURN
1040 LET m=VAL i$: RETURN
1050 LET f=VAL i$: IF d+m+f<>10
THEN LET err=1
1055 RETURN
1060 LET q(t)=w(CODE a$(t,16+((C
ODE (i$)-65)*6)+2)-64,3)
1062 IF a$(t,16+((CODE (i$)-65)*
6+1))<>"G" THEN LET g(t)=80
1064 IF a$(t,16+((CODE (i$)-65)*
6+4))<>"P" THEN LET g(t)=70
1066 LET v1=10-d: LET b$(t,1)=i$
: RETURN
1070 REM
1080 REM
1090 REM
1100 GO TO 1112
1110 LET v1=15-m
1112 LET b$(t,v-d+(2*(d-4)))=i$
```

If you're bored with zapping aliens and find adventure games too restricting then your future happiness may lie in computer moderated games (CMGs). They leave the cunning, strategy and tactics to humans while relegating the witless computer to number crunching.

The mechanics of CMGs are quite simple. The game is played in a number of turns: each player fills in an order form which is sent to the games master (GM) — he who owns the computer. The GM then enters the orders into the machine, prints the turn reports, distributes them to the players and the game proper commences.

The beauty of such a system is that the computer need not be in the same location as the players. One CMG, run from California, has thousands of players throughout the world. It's based on a feudal kingdom and even has its own currency!

These large American games are expensive to play (around £2.50 per turn) and are therefore more the domain of the idle rich. Consequently, CMGs might have remained in obscurity if it hadn't been for a dedicated band of fanatics who played games by post.

The postal games hobby was founded in the 1960s for those who enjoyed playing adult board games but hadn't the time nor the opponents for face to face combat. Players sent in orders every month to be processed by the GM and the results appeared in amateur magazines distributed to the players for a few pence.

As you can see, the postal players were playing CMGs twenty years ago but without the computers. With the advent of affordable machines this has changed and now few GMs are without a trusted micro.

Consequently, low cost CMGs have been developed as an amateur hobby and the following listing is the first for such a game in a professional magazine.

Superleague

Many subjects lend themselves to this game format, ranging from galactic war to football management: the latter is the subject of the game featured here. Called Superleague, the explanation given below can be distributed to the players as a set of rules.

Rules

The year is 2044 and the football league has been reduced to 10 teams. You are the manager of one of these teams and your first task is to buy a squad of players using a meagre budget of one million credits. A table of the cost of players is printed below.

Player Level	Cost (credits)
0	10,000
1	40,000
2	70,000
3	110,000
4	170,000
5	210,000
6	300,000
7	400,000

```
1114 IF a$(t,16+((CODE (i$)-65)*
6+4))="S" THEN RETURN
1115 LET lvl=CODE (a$(t,16+((COD
E (i$)-65)*6+4)))-64
1116 IF a$(t,16+((CODE (i$)-65)*
6+4))="I" THEN LET lvl=INT (lvl/
2)
1117 IF a$(t,16+((CODE (i$)-65)*
6+1))="D" THEN LET lvl=lvl-2
1118 IF lvl<0 THEN LET lvl=0
1119 LET d(t)=d(t)+lvl: RETURN
1120 REM
1130 REM
1140 REM
1150 GO TO 1162
1160 LET v1=20-f
1162 LET b$(t,v-(15-m)+d+2)=i$
1164 IF a$(t,16+((CODE (i$)-65)*
6+4))="S" THEN RETURN
1165 LET lvl=CODE (a$(t,16+((COD
E (i$)-65)*6+4)))-64
1166 IF a$(t,16+((CODE (i$)-65)*
6+4))="I" THEN LET lvl=INT (lvl/
2)
1167 IF a$(t,16+((CODE (i$)-65)*
6+1))="M" THEN LET lvl=lvl-2
1168 IF lvl<0 THEN LET lvl=0
1169 LET m(t)=m(t)+lvl: RETURN
1170 REM
1180 REM ----------------------
1190 REM
1200 REM
1210 LET b$(t,v-(20-f)+d+m+2)=i$
1214 IF a$(t,16+((CODE (i$)-65)*
6+4))="S" THEN RETURN
1215 LET lvl=CODE (a$(t,16+((COD
E (i$)-65)*6+4)))-64
1216 IF a$(t,16+((CODE (i$)-65)*
6+4))="I" THEN LET lvl=INT (lvl/
2)
1217 IF a$(t,16+((CODE (i$)-65)*
6+1))="F" THEN LET lvl=lvl-2
1218 IF lvl<0 THEN LET lvl=0
1219 LET f(t)=f(t)+lvl: RETURN
1220 LET s(t)=VAL i$: RETURN
1230 LET t$(t)=i$: RETURN
1240 LET r$(t)=i$: RETURN
1250 LET c$(t,1)=i$: RETURN
1260 LET c$(t,2)=i$: RETURN
1270 LET c$(t,v-22)=i$: RETURN
1280 LET c$(t,v-22)=i$: RETURN
1290 LET t((t*2)-2+trp,1)=CODE (
i$)-64: RETURN
1360 REM
1370 REM
1380 REM Tactics subroutine
1390 REM
1400 IF t$(home)<>t$(away) THEN
GO TO 1460
1410 IF t$(home)="a" THEN RETURN

1420 IF t$(home)="m" THEN LET hs
c=hsc-w(CODE a$(away,16)-64,2)
1430 IF t$(home)="m" THEN LET as
c=asc-w(CODE a$(home,16)-64,2)
1440 IF t$(home)="o" THEN LET ac
h=ach+w(CODE a$(away,14)-64,1)-w
(CODE a$(home,14)-64,1)
1450 IF t$(home)="o" THEN LET hc
h=hch+w(CODE a$(home,14)-64,1)-w
(CODE a$(away,14)-64,1): RETURN
1460 IF t$(home)="m" THEN LET as
c=asc-w(CODE a$(home,16)-64,2)
1470 IF t$(away)="m" THEN LET hs
c=hsc-w(CODE a$(away,16)-64,2)
1480 IF t$(home)<>"o" THEN GO TO
 1540
1490 LET off=(CODE a$(home,14))-
64
1500 IF t$(away)="a" THEN LET of
f=off-(CODE a$(away,15))-64
1510 IF off<=0 THEN GO TO 1540
1520 IF off>=4 THEN LET hch=hch+
w(off,1): GO TO 1540
1530 LET asc=asc+w(off,1)
1540 IF t$(away)<>"o" THEN GO TO
 1600
1550 LET off=(CODE a$(away,14))-
64
1560 IF t$(home)="a" THEN LET of
f=off-(CODE a$(home,15))-64
1570 IF off<=0 THEN GO TO 1600
1580 IF off>=4 THEN LET ach=ach+
w(off,1): GO TO 1600
1590 LET hsc=hsc+w(off,1)
1600 RETURN
1610 REM
```

```
1620 REM ----------------------
1630 REM Incidents subroutine
1640 REM
1650 FOR n=1 TO 11
1660 IF RND*30<=s(away) THEN LET
 b$(home,n+11)="i"
1670 IF RND*30<=s(home) THEN LET
 b$(home,n+11)="b"
1680 IF RND*30<=s(home) THEN LET
 b$(away,n+11)="i"
1690 IF RND*30<=s(away) THEN LET
 b$(away,n+11)="b"
1700 NEXT n
1710 RETURN
1720 REM ----------------------
1730 REM Process orders
1740 REM
1750 REM Processes orders to
1760 REM produce match results.
1770 REM ----------------------
1780 FOR m=1 TO 5: REM Loop thru
fixture list
1790 LET home=VAL (f$(week,((m-1
)*4)+1))+1
1800 LET away=VAL (f$(week,((m-1
)*4)+3))+1
1810 LET m(home)=m(home)+2+v(s(h
ome),7)
1820 LET d(home)=d(home)+2+v(s(h
ome),8)
1830 LET f(home)=f(home)+2+v(s(h
ome),6)
1840 LET d(away)=d(away)+2+v(s(a
way),8)
1850 LET m(away)=m(away)+2+v(s(a
way),7)
1860 LET f(away)=f(away)+2+v(s(a
way),6)
1870 LET hch=(m(home)/(m(away)+m
(home)))*32
1880 LET ach=(m(away)/(m(home)+m
(away)))*32
1890 LET hch=hch+INT (v(s(away),
s(home))/10)
1900 LET ach=ach+INT (v(s(home),
s(away))/10)
1910 LET hsc=f(home)*100/(f(home
)+d(away))
1920 LET asc=f(away)*100/(f(away
)+d(home))
1930 GO SUB tactics
1940 LET hg=0: LET ag=0
1950 FOR n=1 TO hch
1960 IF RND*100<hsc AND RND*100<
g(away) THEN LET hg=hg+1
1970 NEXT n
1980 FOR n=1 TO ach
1990 IF RND*100<asc AND RND*100<
g(home) THEN LET ag=ag+1
2000 NEXT n
2010 IF hg>6 THEN LET hg=6
2020 IF ag>6 THEN LET ag=6
2030 LET f$(week,((m-1)*4)+2)=ST
R$ (hg)
2040 LET f$(week,((m-1)*4)+4)=ST
R$ (ag)
2050 PRINT : PRINT a$(home,1 TO
10);" ";hg;"  ";a$(away,1 TO 10)
;" ";ag
2052 IF hg=ag THEN LET a$(home,1
1)=CHR$ (CODE a$(home,11)+1): LE
T a$(away,11)=CHR$ (CODE a$(away
,11)+1)
2054 IF hg>ag THEN LET a$(home,1
1)=CHR$ (CODE a$(home,11)+3)
2056 IF hg<ag THEN LET a$(away,1
1)=CHR$ (CODE a$(away,11)+3)
2058 LET a$(home,12)=CHR$ (CODE
a$(home,12)+hg): LET a$(away,12)
=CHR$ (CODE a$(away,12)+ag)
2059 LET a$(home,13)=CHR$ (CODE
a$(home,13)+ag): LET a$(away,13)
=CHR$ (CODE a$(away,13)+hg)
2060 GO SUB incidents
2070 NEXT m
2080 FOR n=1 TO 10
2090 GO SUB training
2100 GO SUB updatefiles
2110 NEXT n
2120 GO SUB transfer
2130 RETURN
2140 REM
2150 REM ----------------------
2160 REM Training subroutine
2170 REM
2180 IF r$(n)<>"1" THEN GO TO 22
```

8	500,000
9	650,000

Before you plan your squad a little more information is required. Players fall into four distinct groups: goalkeepers, defenders, midfielders and forwards. They all cost the same per level but you should have reserves of each type. Incidentally, avoid spending all your budget immediately as other players become available throughout the season via the league transfer list. The maximum number of players allowed in a squad is 26.

A player's level is central to the game and is a measure of his skill and fitness. The top level which any player may reach is 20, but when a manager purchases a player he has no idea what the player's maximum potential is. This is generated randomly by the program during the game.

Levels are important as they directly affect the outcome of each game. For example, the difference between the team's midfield levels determines the number of scoring chances generated from midfield.

The players are divided into groups by the field position in which they play. A forward can be played in goal but his effective level will be reduced. Similarly, circumstances may dictate that you field injured or suspended players. An injured player plays at below his normal level, while fielding a suspended player is the equivalent of playing a junior (not one of your stars) and results in a playing level of minus one.

Once your squad selections have been submitted the game begins. At each turn the GM asks you to send in a completed order form which contains the following information for the coming turn:

Team formation. 4-3-3, for example, is the formation in which your team will play. It shows the number of defenders, midfield players and forwards.

Team sheet. Fill in the squad letters of the players you wish to play. Note that the league imposes the following restrictions: you must play one and only one goalkeeper, between two and five players in the other field areas and have a maximum of 11 players.

Style of play. A number between one and five representing a range of styles from brutal (1) to protective (5). The style you play affects not only the number of fouls you concede but also your opponents' injuries and the number of your team's players that are booked. If a player is booked three times he's suspended for a number of weeks.

Team tactics. There are three main tactics employed by teams in Superleague: man to man marking, the offside trap and the anti-offside trap. Each team has an initial rating in each of these tactics of one.

```
30
2190 FOR m=1 TO 11
2200 LET lvl=CODE (a$(n,18+((COD
E (b$(n,m))-64+1)*6)))-64
2210 IF RND*10<2 THEN LET a$(n,1
8+((CODE (b$(n,m))-64+1)*6))=CHR
$ (lvl+65)
2220 NEXT m
2230 IF r$(n)="o" THEN LET a$(n,
14)=CHR$ ((CODE (a$(n,14)))+1)
2240 IF r$(n)="a" THEN LET a$(n,
15)=CHR$ ((CODE (a$(n,15)))+1)
2250 IF r$(n)="m" THEN LET a$(n,
16)=CHR$ ((CODE (a$(n,16)))+1)
2260 RETURN
2270 REM
2280 REM ----------------------
2290 REM Updatefiles subroutine
2300 FOR m=1 TO 11
2305 LET pno=CODE (b$(n,m))-64
2310 LET lvl=CODE (a$(n,18+((COD
E (b$(n,m))-64+1)*6)))-64
2320 LET plvl=CODE (a$(n,19+((CO
DE (b$(n,m))-64+1)*6)))-64
2330 IF lvl>plvl THEN LET a$(n,1
8+((CODE (b$(n,m))-64+1)*6))=CHR
$ (plvl+64)
2332 LET to=16+((pno-1)*6)+5: IF
 VAL a$(n,to)>0 THEN LET a$(n,to
)=STR$ (VAL a$(n,to)-1)
2333 IF a$(n,16+((pno-1)*6)+5)="
0" THEN LET a$(n,16+((pno-1)*6)+
4)="P"
2335 NEXT m
2340 IF (CODE (a$(n,14))-64)>20
THEN LET a$(n,14)=CHR$ (20)
2350 IF (CODE (a$(n,15))-64)>4 T
HEN LET a$(n,15)=CHR$ (4)
2360 IF (CODE (a$(n,16))-64)>20
THEN LET a$(n,16)=CHR$ (20)
2370 FOR m=1 TO 11
2380 IF b$(n,m+11)=" " THEN GO T
O 2520
2390 LET pno=CODE (b$(n,m))-64
2400 IF a$(n,16+((pno-1)*6)+4)<>
"P" THEN GO TO 2520
2410 IF b$(n,m+11)<>"i" THEN GO
TO 2450
2420 LET a$(n,16+((pno-1)*6)+4)=
"I"
2430 LET a$(n,16+((pno-1)*6)+5)=
STR$ (INT (RND*4)+1)
2440 GO TO 2520
2450 LET disp=VAL (a$(n,16+((pno
-1)*6)+6))
2460 LET disp=disp+1
2470 IF disp<=3 THEN GO TO 2510
2480 LET a$(n,16+((pno-1)*6)+4)=
"S"
2490 LET a$(n,16+((pno-1)*6)+5)=
STR$ (INT (RND*4)+1)
2500 LET disp=0
2510 LET a$(n,16+((pno-1)*6)+6)=
STR$ (disp)
2520 NEXT m
2529 RETURN
2530 REM Transfer subroutine
2540 REM
2550 REM ----------------------
2560 DIM l(26,2)
2570 FOR n=1 TO 20
2580 IF t(n,1)=0 THEN GO TO 2630
2590 IF t(n,2)<l(t(n,1),1) THEN
GO TO 2630
2600 IF t(n,2)>c(INT ((n+1.5)*.5
)) THEN GO TO 2630
2610 LET l(t(n,1),1)=t(n,2)
2620 LET l(t(n,1),2)=INT ((n+1.5
)*.5)
2630 NEXT n
2640 FOR n=1 TO 26
2650 IF l$(n,7)="y" THEN GO TO 2
730
2660 IF l(n,1)=0 THEN GO TO 2730
2670 LET team=l(n,1)
2680 LET sqdno=CODE (a$(n,173))-
64
2690 LET a$(team,sqdno TO sqdno+
6)=l$(n,1 TO 6)
2700 LET a$(n,173)=CHR$ (sqdno+6
5)
2710 LET c(team)=c(team)-l(n,2)
2720 LET l$(n,7)="y"
2730 NEXT n
2740>IF w<=13 THEN LET l$((w*2)-
1,7)="n": LET l$(w*2,7)="n"
2750 RETURN
2760 REM Report routine
2770 REM
2780 REM Produces a report for
2790 REM each player including
2800 REM results,league table,
2810 REM fixtures and incident
2820 REM reports.
2830 REM
2840 REM ----------------------
2845 DIM x(10): DIM z(10)
2850 GO SUB sort
2860 FOR n=1 TO 10
2870 CLS : PRINT "Printing": GO
SUB print
2890 PRINT "Is the print OK ?"
2900 GO SUB OK
2910 IF INKEY$="n" THEN LET n=n-
1
2920 NEXT n
2930 RETURN
2940 REM Sort subroutine
2950 REM
2960 REM ----------------------
2970 FOR n=1 TO 10
2980 LET x(n)=n
2990 LET z(n)=((CODE a$(n,11))-6
4)+1+(((CODE a$(n,12))-64)-((COD
E a$(n,13))-64))/10
3000 NEXT n
3010 LET swap=0
3020 FOR n=2 TO 10
3030 IF z(n)<=z(n-1) THEN GO TO
3070
3040 LET work=z(n): LET z(n)=z(n
-1): LET z(n-1)=work
3050 LET work=x(n): LET x(n)=x(n
-1): LET x(n-1)=work
3060 LET swap=swap+1
3070 NEXT n
3080 IF swap>0 THEN GO TO 3010
3090 RETURN
3100 REM Print subroutine
3110 REM
3120 REM ----------------------
3130 LPRINT "Superleague Report
for week ";w
3140 LPRINT : LPRINT "To the man
ager of ";a$(n,1 TO 10)
3150 LPRINT : LPRINT "Week ";w;"
 results"
3155 IF w=18 THEN LPRINT "
 Final Results"
3160 FOR m=1 TO 5
3170 LPRINT a$(VAL (f$(week,((m-
1)*4)+1))+1,1 TO 10);"  ";VAL (f
$(week,((m-1)*4)+2));" v ";
3180 LPRINT a$(VAL (f$(week,((m-
1)*4)+3))+1,1 TO 10);"  ";VAL (f
$(week,((m-1)*4)+4))
3190 NEXT m
3200 LPRINT : LPRINT "League tab
le"
3210 LPRINT : LPRINT "    Team
  Pld  GF  GA  Pts"
3220 FOR p=1 TO 10
3230 LPRINT a$(x(p),1 TO 10);"
 ";w;"   ";CODE (a$(x(p),12))-64
;"   ";CODE (a$(x(p),13))-64;"
 ";CODE (a$(x(p),11))-64
3240 NEXT p
3250 LPRINT : LPRINT "Team detai
ls"
3260 LPRINT "Budget remaining ";
c(n);" credits"
3270 LPRINT "Tactical levels"
3280 LPRINT "offside trap = ";CO
DE (a$(n,14))-64
3290 LPRINT "anti-offside trap =
 ";CODE (a$(n,15))-64
3300 LPRINT "Man to man marking
= ";CODE (a$(n,16))-64
3310 LPRINT : LPRINT "Squad deta
ils"
3320 LPRINT : LPRINT "Plr Typ Lv
l Status Disp Out for"
3330 LPRINT "cde
Pts  no weeks"
```

The tactics employed by each team and its skill in effecting them influence the match result. There is also interaction between tactics used by the teams; for example, the effectiveness of an offside trap is reduced if the opponents are playing anti-offside tactics.

Training. Each week the club's trainer coaches his players in one area. He may increase individual players' levels or increase the team's skill in a particular tactic.

Scouting. Information on the opposing team's players and tactical skills is invaluable to you as a manager so scouts are employed. For each turn you may request the skill level of one particular tactic and details of two players.

Transfer bids. You can make two bids for any player currently on the transfer list. They are scouted (enter Z for team code) and the highest bid will buy the player.

All orders are collected by the GM and entered into the computer, which processes them and produces printed reports for each manager. These reports contain essential information including match results, league table, next week's fixtures, transfer list, scouting information and details of your team and squad of players.

The object of the game is to win the league. There are no restrictions on the exchange of information between managers but remember — there's only one winner.

Each team plays each other twice in a season with three points awarded for a win and one for a draw. Any ties in points totals are resolved by goal difference.

Coding

The three main functions of a computer moderated game are: accepting order entry; processing the orders; and, finally, printing out the results.

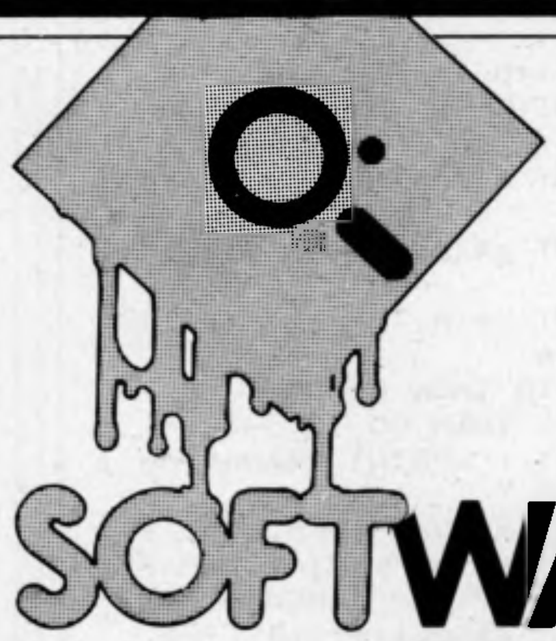
The order entry routine should ideally be as user-friendly as possible and mirror the order form format. The input routine of the listing includes a validation check that intercepts errors before they can get into the program. Central to this validation procedure is the string array V$ which includes in its fields the following information: the coordinates for data input; the range of allowed values; and a pointer to the correct assignment statement so that data can be stored in the correct variable.

When the orders have been entered they are processed by the program in accordance with the rules of the game: the relative strengths of the teams are determined before the matches commence. When the matches are over, the appropriate files are updated before continuing to the reports section.

Finally, reports are printed and sent to each player but it's important to include a facility to reprint reports made illegible by printer malfunction.

END

```
3340 FOR p=1 TO CODE (a$(n,173))
-64
3350 LPRINT " ";CHR$ (p+64);"
";a$(n,16+((p-1)*6)+1);"    ";
3360 LPRINT CODE (a$(n,16+((p-1)
*6)+2))-64;"      ";
3370 LPRINT a$(n,16+((p-1)*6)+4)
;"       ";
3380 LPRINT a$(n,16+((p-1)*6)+6)
;"    ";
3390 LPRINT a$(n,16+((p-1)*6)+5)
3400 NEXT p
3405 IF w=18 THEN RETURN
3407 IF w=0 THEN GO TO 3430
3410 LPRINT : LPRINT "Scouting I
nformation"
3416 LPRINT a$(VAL c$(n,1)+1,1 T
O 10);" skill in ";c$(n,2);" =";
3417 IF c$(n,2)="o" THEN LPRINT
VAL (a$(VAL c$(n,1)+1,14))-64
3418 IF c$(n,2)="a" THEN LPRINT
VAL (a$(VAL c$(n,1)+1,15))-64
3419 IF c$(n,2)="m" THEN LPRINT
VAL (a$(VAL c$(n,1)+1,16))-64
3420 FOR s=3 TO 5 STEP 2
3421 LPRINT "Team       cde type
level dis to"
3422 LET p=VAL c$(n,s)+1: LET q=
CODE (c$(n,s+1))-64
3423 LPRINT a$(p,1 TO 10);" ";c$
(n,s+1);"    ";a$(p,16+((q-1)*6)
+1);"    ";CODE (a$(p,16+((q-1)*
6)+2))-64;"    ";a$(p,16+((q-1)*
6)+6);"  ";a$(p,16+((q-1)*6)+6)
3429 NEXT s
3430 LPRINT : LPRINT "Next weeks
 fixtures"
3440 FOR m=1 TO 5
3450 LPRINT a$(VAL (f$(week+1,((
m-1)*4)+1))+1,1 TO 10);" v "¦a$(
VAL (f$(week+1,((m-1)*4)+3))+1,1
 TO 10)
3460 NEXT m
3462 IF w>16 THEN GO TO 3470
3464 LPRINT : LPRINT "Following
weeks fixtures."
3466 LPRINT a$(VAL (f$(week+2,((
m-1)*4)+1))+1,1 TO 10);" v ";a$(
VAL (f$(week+2,((m-1)*4)+3))+1,1
 TO 10)
3468 NEXT m
3470 LPRINT : LPRINT "Current tr
ansfer list"
3480 LPRINT : LPRINT "No.  Type"
3490 FOR p=1 TO 26
3500 IF 1$(p,7)="y" THEN GO TO 3
520
3510 LPRINT CHR$ (P+64);"    ";1$
(p,1)
3520 NEXT p
3530 LPRINT : LPRINT : LPRINT "-
------------------------------";
 LPRINT : LPRINT
3540 RETURN
3550 FOR m=1 TO 10
3560 BORDER 0: PAPER 0: INK 6: C
LS
3570 PRINT AT 0,9;"Superleague"
3580 PRINT AT 1,9;"setup screen"
3590 PRINT : PRINT "Enter name f
or team ";m
3600 PRINT : PRINT "Enter squad
details (Type/level)"
3610 PRINT AT 6,15;"-Type 'z' to
 end"
3620 PRINT "     Type level
  Type Level"
3630 FOR n=1 TO 13
3640 PRINT AT 7+n,2;CHR$ (64+n);
"   -     -       ";CHR$ (64+n+1
3);"   -     -"
3650 NEXT n
3660 LET ix=3: LET iy=21: LET n$
=""
3670 FOR n=1 TO 10
3680 LET iy=iy+1
3690 GO SUB input
3700 LET n$=n$+i$
3710 NEXT n
3720 LET a$(m,1 TO 10)=n$
3730 FOR n=1 TO 26
3740 LET iy=6: LET ix=7+n
3750 IF ix>20 THEN LET ix=ix-13:
 LET iy=24
3760 GO SUB input
3770 IF i$="z" THEN GO TO 3910
3780 FOR p=1 TO 4: IF i$=w$(p) T
HEN GO TO 3810
3790 NEXT p
3800 GO TO 3760
3810 LET a$(m,16+((n-1)*6)+1)=i$
3820 LET iy=iy+6
3830 GO SUB input
3834 IF i$>="0" AND i$<="9" THEN
 GO TO 3840
3836>GO TO 3830
3840 LET a$(m,16+((n-1)*6)+2)=CH
R$ (VAL i$+64)
3850 LET a$(m,16+((n-1)*6)+3)=CH
R$ (VAL i$+64+INT (RND*10))
3860 LET a$(m,16+((n-1)*6)+4)="P
"
3870 LET a$(m,16+((n-1)*6)+5)="0
"
3880 LET a$(m,16+((n-1)*6)+6)="0
"
3890 LET c(m)=c(m)-w((VAL i$+1),
4)*1000
3895 PRINT AT 21,0;"Credits left
 =";c(m);"    "
3900 NEXT n
3910 LET a$(m,11 TO 16)="@@@AAA"
3930 PAUSE 20: CLS
3940 LET a$(m,173)=CHR$ (n+63)
3950 NEXT m
3951 CLS : PRINT "printing team
details"
3952 FOR n=1 TO 10
3953 LPRINT "Team List"
3954 FOR m=0 TO 9
3955 LPRINT " ";m;"  ";a$(m+1,1
TO 10)
3956 NEXT m
3957 LET w=0: LET week=0
3958 GO SUB 3250
3959 NEXT n
3960 GO TO 130
3970 REM ----------------------
3980 REM
3990 REM  Data statements
4000 REM
4010 DATA 24,21,15,12,6,2,3,4,30
,24,18,15,9,1,1,2,36,27,24,21,15
,0,0,0,42,33,30,24,21,-1,-1,-1,4
5,36,33,30,24,-2,-3,-2
4020 DATA 10,5,55,10,5,4,35,40,3
,0,30,70,1,-3,25,110,1,-5,20,170
,2,-7,18,210,2,-9,16,300,3,-10,1
5,400,3,-11,14,500,4,-12,13,650
4030 DATA 4,-13,12,800,4,-14,11,
900,5,-15,10,0,5,-16,9,0,5,-17,8
,0,8,-18,7,0,6,-19,6,0,7,-21,5,0
,7,-23,4,0,8,-25,3,0
4040 DATA "00109020803070406050"
,"00201030904080507060","0030204
0105090608070","00403050206010709
080","00504060307020801090","00
60507040803090201O","00706080509
040103020","00807090601050204030
","00908010702060305040"
4050 DATA "50604070308020901000"
,"60705080409030102000","7080609
0501040203000","80907010602050304
000","90108020703060405000","10
20903080407050600O","20301040905
080607000","30402050106090708000
","40503060207010809000"
4060 DATA "EP02345BA","EQ02345CB
","ER02345DC","FZRAZAZ$D","GVRAZ
AZFE","GYRAZAZGF","GZRAZAZHG","G
\RAZAZIH","G^RAZAZ$I","HVRAZAZKJ
","HXRAZAZLK","HZRAZAZML","H\RAZ
AZNM","H^RAZAZ$N","IVRAZAZPO","I
XRAZAZQP","IZRAZAZRQ","I\RAZAZSR
","I^RAZAZTS","GNR1515UT","IHOoa
mmVU","KIOloamWV","MPRO909XW","M
ZOoammYX","NPRO9ZZZY","NYRAZAZ[Z
","OPRO9ZZ\Y","OYRAZAZ]Z","QRRAZ
AZ^[","QZ-----_$","RRRAZAZ`[","R
Z-----_$","eof"
4070 DATA "DAEnter orders for","
FAEnter formation ---   Team She
et","HAStyle of play -","JATacti
cs - o/a/m","LATraining - 1/o/a/
m","NAScouting   Team - Tactics
-","OA           Team - Player -
","PA           Team - Player -"
,"RATransfer list Cde - Offer","
SA                Cde - Offer"
4080 DATA 300,1730,2760,840,600,
700,1000,920,1380,1630,2160,2290
,2530,2940,3100
```



Training Packages

Getting to know a spreadsheet can be difficult, especially if you have to rely on the manual. But there are alternatives. Mike Liardet and Jerry Sanders investigate onscreen, hands-on spreadsheet training packages

Many specialist training establishments have recognised that software suppliers are not moving fast enough with training, and are offering their own training packages, especially for the popular products like spreadsheets. Three such organisations are Advanced Systems Incorporated (ASI), Infosound and Microcal.

ASI is relatively new to the world of micros, but has a long-established reputation for in-house mainframe training with large multi-national companies. Infosound and Microcal are both younger UK companies, started in 1981 and 1982 respectively, but flourishing. Infosound also began with in-house audio training for large companies and is now exporting to the States, where Infosound Inc was set up *after* the UK parent company. Microcal also seems to be doing well. It claims to have sold more micro training packages — 70,000 plus — than any of its competitors.

ASI and Microcal use product simulation while Infosound's technique is to have you load up the real thing and then follow a cassette-based tutorial. So how does the spreadsheet training of the three companies compare?

MicroTutor

Maker: ASI
Spreadsheet Training for: Lotus 1-2-3; VisiCalc; EasyPlanner
Price: £60 plus VAT per course.
Contact: Freephone MicroTutor or (01) 602 3011

ASI manuals claim to get you up and running in a couple of hours! This is an exaggeration and may even put some people off: who wants to pay £60 plus VAT for something they won't be using for more than an hour or two? The paradox is that the less time you spend *with* the software the more you should be prepared to spend *on* it, but even so the MicroTutor series is the least expensive of the packages reviewed here.

Each MicroTutor product is supplied as a single disk with a ring-bound manual in an IBM-style library case. Much of the manual repeats information covered in the course itself and I found it by and large superfluous — it's just that software purchasers expect manuals for their money!

The start-up instructions tell you to switch the machine on with the operating system disk in drive 'A' and the MicroTutor disk in 'B'. Activate the 'B' drive by typing 'B:', then enter the tutorial by typing ATI. Why not ASI? ATI is the American company whose products ASI has adopted, pepped up and marketed as the MicroTutor series!

After a list of credits to rival the opening of *Ben Hur* a main menu appears, giving the option of ending (!), running through a pre-programmed sequence of lessons or selecting your own lessons..

If the Escape key is pressed to finish you are subjected to yet more ASI 'blurb' — this time a run-down on the complete range of 22 MicroTutor products. If the wrong disk is inserted at the beginning, the complete run-through takes one minute 20 seconds before you see the magic message: "END OF ATI TRAINING POWER." A not insignificant in-road on the hour that ASI claims you will need.

The MicroTutor products assume a basic understanding of the keyboard. The documentation provides information on special keystrokes, such as CTRL and 'function keys' but not SHIFT. Neither is the TAB key explained (it's not marked as such on the PC). Whenever MicroTutor expects a keystroke to be made it indicates what is needed with a highlighted message. MicroTutor will usually accept either upper or lower case letters equally, if that is the way the real software works. It does not go into laborious detail on exactly how to make the keystroke, and if you do get it wrong it tells you to try again.

The general MicroTutor approach is to present a lesson as a sequence of information screens. Some screens are simply explanation, in which case the space bar is pressed when reading has finished.

The most interesting parts of the lessons are the simulations. The screen is split in two: the top half is a precise snapshot of a screen from the product you are learning, and the bottom half displays MicroTutor's explanation and instructions. MicroTutor warns that you are seeing a simulation and that in reality the whole screen would display the spreadsheet, so there is minimal chance of any confusion. MicroTutor is unable to record spreadsheet changes instantly so there is a short pause while it reads the next screen from disk, and then redraws it from top to bottom.

The required keystrokes are always highlighted and it's not usually necessary to enter more than three or four at a time; it is actually possible to skim through a lesson doing nothing more than finding your way around the keyboard.

It is possible to abandon a lesson by pressing the Escape key but there is no facility for resuming exactly where you left off. A genuine beginner takes about 30 minutes for a lesson, but it is possible to do a lesson in five minutes if you are an expert, lending some validity to

ASI's one-hour claim. If you *can* do the lessons at that speed then you don't need MicroTutor!

I liked the content and style of the MicroTutor lessons. ASI's years of experience in training have been put to good use here. The general treatment is clear, simple and factual.

A review menu is included: this is actually a misnomer, since it does not give access to review material at all but enables you to sequence the lessons themselves, although I was never quite sure which keystrokes would find it. As an example of a review menu the VisiCalc MicroTutor offers a choice of any one of 10 lessons (Fig 1). However, to go through an uninterrupted sequence of lessons the letters for the lessons are typed in any order and input by pressing ENTER. To start with, it is better to take the lessons in the sequence given. There is little benefit in being able to print the spreadsheet (option H) if you cannot set it up in the first place (option A).

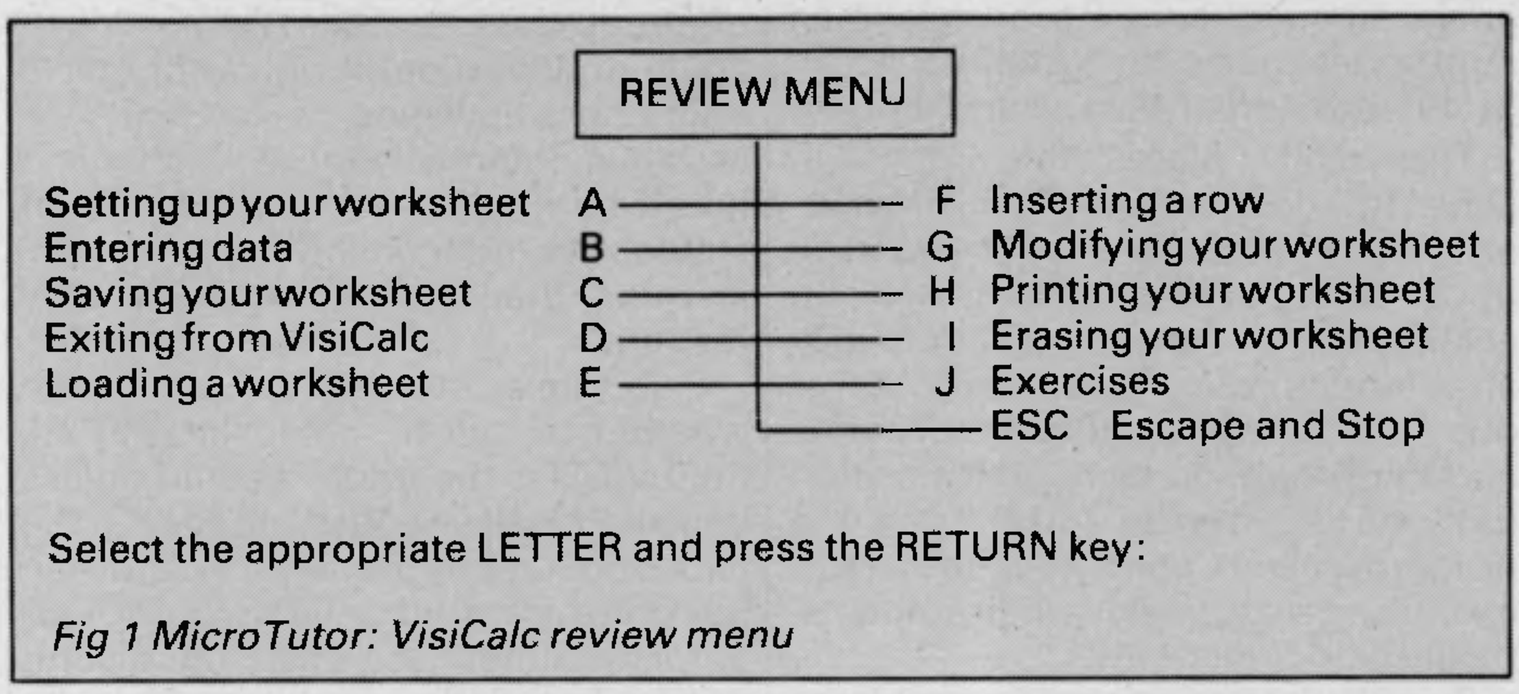


Fig 1 MicroTutor: VisiCalc review menu

Lotus 1-2-3

The Lotus 1-2-3 MicroTutor is the best value for money in terms of course content. There are approximately 250,000 characters of tutorial text on the disk, arranged as 13 lessons. In fact, the MicroTutor 1-2-3 disk directory shows 26 text files in all, with mysterious names like '160.X'. It would be neater if all this information were organised in just one file.

Fairly early on, the tutorial comes up with the recommendation that you familiarise yourself with 1-2-3's own tutorial. This advice is better ignored. The MicroTutor's real strength lies with complete newcomers, and if you are prepared to work through the manufacturer's own material then you can probably dispense with MicroTutor altogether.

The introductory material gives several screens of overview explaining briefly what 1-2-3 is ('a powerful software program designed to help you manage and control information') and what can be done with it ('spreadsheet, electronic filing cabinet, graphics system or word processor').

MicroTutor then tells you what to expect, outlining the content of the different lessons, and at this point you are ready to start your first lesson. Let's take one lesson at random and go through it in more detail.

Creating a Database. You are given a run-down on what is going to be done — 'a payroll information system for R & G Inc' — and why you might want to do it — 'to help make decisions on staff payrises.' The first column of the spreadsheet is to be used for names, but it looks too narrow. The MicroTutor takes you carefully through each keystroke needed to change the column width. If you hit the wrong key it repeats the request until you get it right. The simulation display at the top of the screen looks exactly like a real 1-2-3 spreadsheet.

Having got the column width right, you set up a heading 'EMPLOYEE NAME' and the other column headings are automatically done for you.

1-2-3 has a facility for locking titles, where they remain permanently visible at the borders of the screen even when you are working in the depths of the spreadsheet. MicroTutor summarises all the material covered before handing you over to the review menu to select your next lesson.

Many of the lessons continue with this original example, gradually adding bits to it: it serves as a satisfactory vehicle for introducing many of the 1-2-3 facilities. Fig 2 gives some indication of MicroTutor's different levels.

VisiCalc and EasyPlanner

VisiCalc and EasyPlanner are simpler than 1-2-3 so do not merit the same weight of tutorial material.

For a presumably historical reason, the VisiCalc tutorial is not started by typing 'ATI', but 'PLAN-PWR'. This minor anomaly must have slipped through ASI's repackaging process.

The overall tutorial formula is very much the same as 1-2-3 but with some interesting interludes such as the exercise to save to the disk. The disk actually starts whirring even though it is not *really* saving anything. You can't get a much closer simulation than that!

In contrast, the printing exercise is rather less realistic. Following the correctly entered keystrokes, MicroTutor merely tells you that if you were running the real software you would see a real printout at that moment.

In some instances the tutorial tells you to work in a way at odds with 'normal practice'. For example, it is almost always quicker to move short distances around the spreadsheet by using the arrow keys. MicroTutor normally forces you to do it by the GOTO command. This is simpler to arrange in the tutorial but takes longer when you do it in the real system.

At certain moments in the 'whatif' lesson you are asked to watch a specific cell as it changes. On a real spreadsheet system you would be able to do this, but the screen display does not work the same way with MicroTutor. Instead of seeing the new value fall into place you are stunned by the flash as the screen clears and is redrawn from scratch.

EasyPlanner differs slightly from most spreadsheet systems in that it is menu-driven and works by a command language. This presents no special difficulties for tutoring, other than the fact that most operations take more keystrokes.

VisiCalc in One Day

Maker: Infosound/London Business School
Spreadsheet Training for: VisiCalc
Price: £70 plus VAT per course
Contact: Ian Archibald, (01) 305 0549

And now for something slightly different — audio training. The London Business School, in conjunction with Infosound, has just produced its first audio cassette training package. Called 'VisiCalc In One Day', the product is available only on the Apple IIe and IIplus (or Europlus).

This package adopts a very different approach. No simulations at all here: to use the package you must already have purchased VisiCalc for the Apple, and it's with the real package that the training takes place. The advantage is obvious: the full screen is devoted to real functions, and the student can stop at will to explore avenues which look interesting and aren't on the audio script, or simply practise. The disadvantage is that you can't assess the applications product through the training material before you lay out the cash!

VisiCalc In One Day (VIOD) comes in a stout plastic binder containing two audio cassettes, a training disk and a set of 12 help cards which summarise the steps and keystrokes needed to achieve specific functions.

All you need do is insert an audio cassette into a tape recorder and switch on. Stirring opening music is followed by an introduction from the two presenters, John Rye and Nicolette McKenzie. You are told that you'll be offered breakpoints during the course, which is estimated to take eight hours, and that you'll be guided back each time so you can return to where you left off on the screen. Nicolette, in true listen-with-mother tradition, checks that you are sitting in front of an Apple with a VisiCalc disk, and reminds you that it's important to have the right version of the disk for your version of the Apple.

The course assumes that you know

how to turn on the Apple and how the keyboard works, but little else. The first instruction, for example, is: 'Begin by picking up the VisiCalc program disk which has the Visicorp logo on it. Hold the disk by its paper envelope. When you come to remove it from the envelope, be sure to hold it by the label — never touch the exposed parts of the disk.'

The audio scripts have been carefully thought out to avoid confusion. The system adopted is to tell the student what to do first, and then issue a 'do that now' instruction. Users are asked not to take any action until this instruction is issued, although the temptation is often to press the appropriate keys as soon as you catch the narrator's drift! Similarly, for those instructions which take time to execute, a musical jingle is played.

The VIOD training disk contains 19 files, each one a spreadsheet model relating to the business of the third voice on the tape, Dan. Dan has decided to take up an Intergalactic Video Hire franchise for which he needs a large bank loan, so VIOD uses his predicament to illustrate what it calls the 'exciting power' of VisiCalc.

There is no tutorial interaction in VIOD: you carry out the instructions given on the tape, loading in different models as you go. Progress checks are prompted by a narrator telling you that the figure in a particular column should be, say, £10,345. If it isn't, you have three options: consult the relevant help card (the tape points you to the right one); re-wind the tape and go through the sequence of instructions again; or load the correct model from the disk to enable you to go on with the next lesson. This last course of action is highly undesirable if you're a serious student because you never find out where you went wrong.

The opening sequence is a demonstration of what VisiCalc can do. You then learn how to load a Visi-file and watch the effect on Dan's monthly loan repayments of a change in the loan period. This is followed by model building and expansion, replication, formulae and formatting. The same even pace is maintained throughout. By the end of the course all aspects of VisiCalc have been covered, up to and including use of the Data Interchange Format (DIF). Unlike the Hands-On (see below) and MicroTutor series, VIOD makes use of a printer, so you can get hard copy of your work as well as see the results of the printing part of the tutorial.

Hands-On

Maker: Microcal
Spreadsheet Training for: Multiplan
Price: £80 plus VAT per course

Contact: Peter Wellings, (01) 943 1257

The Microcal Hands-On range of products has grown out of a contract to produce training material for Xerox. It includes Hands-On Basic, Cobol (up to mainframe standard), MS-DOS, CP/M, dBasell and, on the spreadsheet front, Multiplan.

Hands-On is in direct competition with MicroTutor, and on the surface approaches the task in the same way. Split-screen simulation is the order of the day again, but Hands-On is different in that it allows trainees the opportunity to type in complete statements, rather than the two or three keystrokes on prompt that MicroTutor demands.

Hands-On's texts are structured in database format as indexed sequential files. When the trainee response has been input, the whole expression analysed and the tutor branches to an appropriate part of the tutorial to teach the bits the student has misunderstood.

This really places the Hands-On series in a different league to MicroTutor. What's more, disks can be used by up to 9000 individual students, and each student is addressed personally after logging on. You can stop at any one of several modular breakpoints and the programs store your position until you log on again. An interrogation program called Supervis enables training managers to analyse their students' results and print reports.

Personalisation can cause problems though. Using Hands-On's MS-DOS training package which works on the same methodology as the Multiplan tutor, I failed to log on after a break. The program informed me that my name and registration number did not match and I was therefore an unauthorised user. In fact, my registration number was 0002 but I had typed 2. I was finally accepted when I typed all four digits.

The Multiplan version for the IBM PC comes on three double-sided, double-density 350k disks, with an A5 ring-bound manual. Four hours is the recommended study time but the documentation stresses that breaks should be taken. Although the program assumes no knowledge of the keyboard, it doesn't teach you what a micro or its peripherals are either: this is covered in the operating system packages, which can be used by absolute beginners.

Conclusions

If you are struggling to learn, all these products have a great deal to recommend them. ASI unashamedly admits that a MicroTutor does not teach you everything, just a 'minimal subset' of the product. Hands-On and VIOD both take longer to use (four and eight hours respectively) and for that reason are able to teach a greater range of material. Hands-On is far more responsive than MicroTutor: the former's ability to branch on response puts it in a different class to MicroTutor's 'do it again until you get it right' approach. This does, however, make Hands-On sessions potentially more lengthy and involved: if you tend to prefer 'parrot fashion' to 'understanding as you go' learning, then MicroTutor is probably for you.

For those still trying to decide whether to buy a spreadsheet at all, then VIOD is the tutor to avoid unless you already have a VisiCalc disk. Of the two simulation products, Hands-On has more all round facilities, but MicroTutor assumes less basic microcomputing knowledge and may thus be better for someone who is new to both spreadsheets *and* microcomputing.

Both MicroTutor and Hands-On are tutorials, so you have no more control over the course of events than is built into the program.

VIOD, on the other hand, being the superimposition of training material on an 'up and running' VisiCalc session, gives you the opportunity to go off at a tangent at any point, and even abandon the course material to follow up an interesting line of enquiry — this approach will probably suit the more adventurous among you!

END

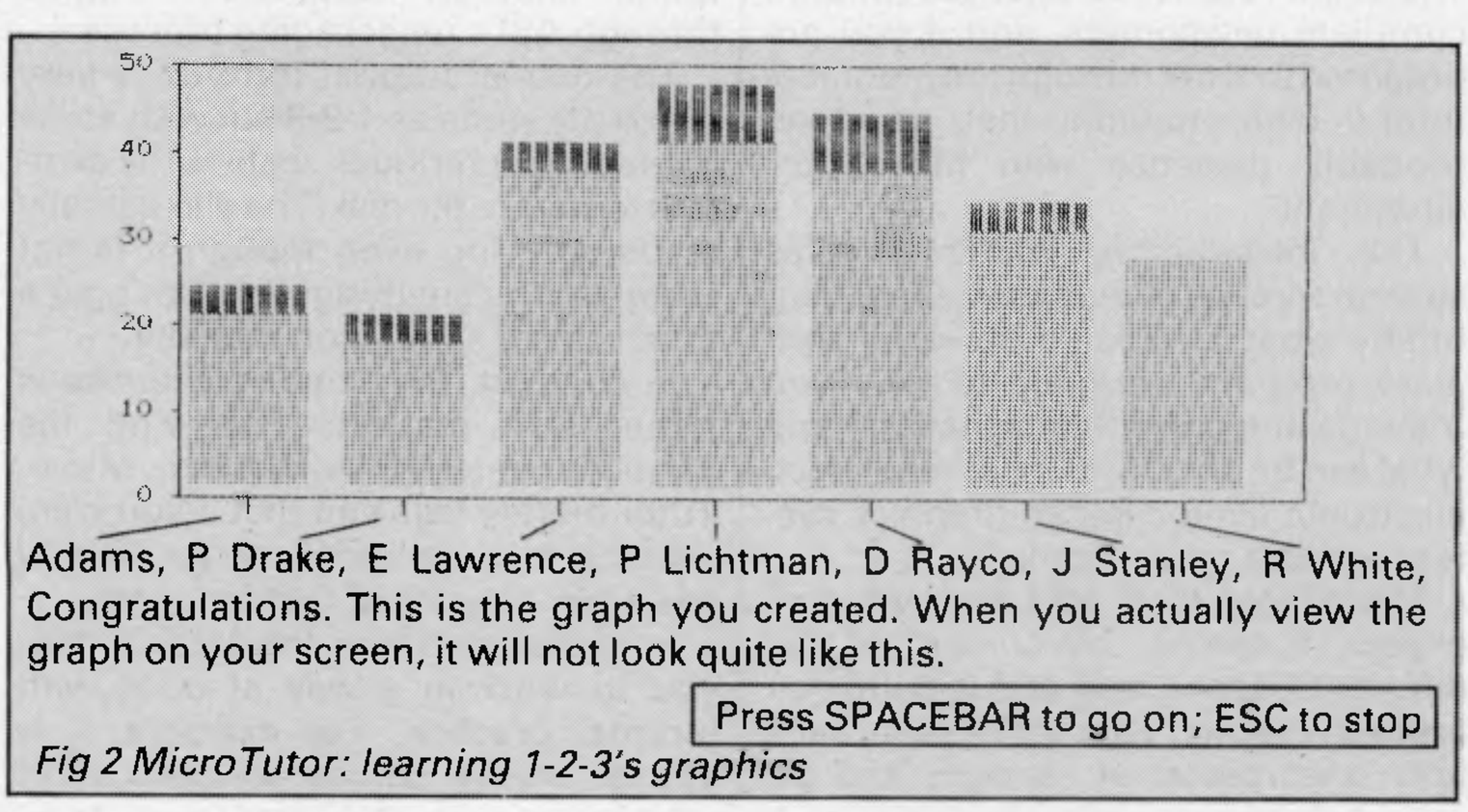


Fig 2 MicroTutor: learning 1-2-3's graphics

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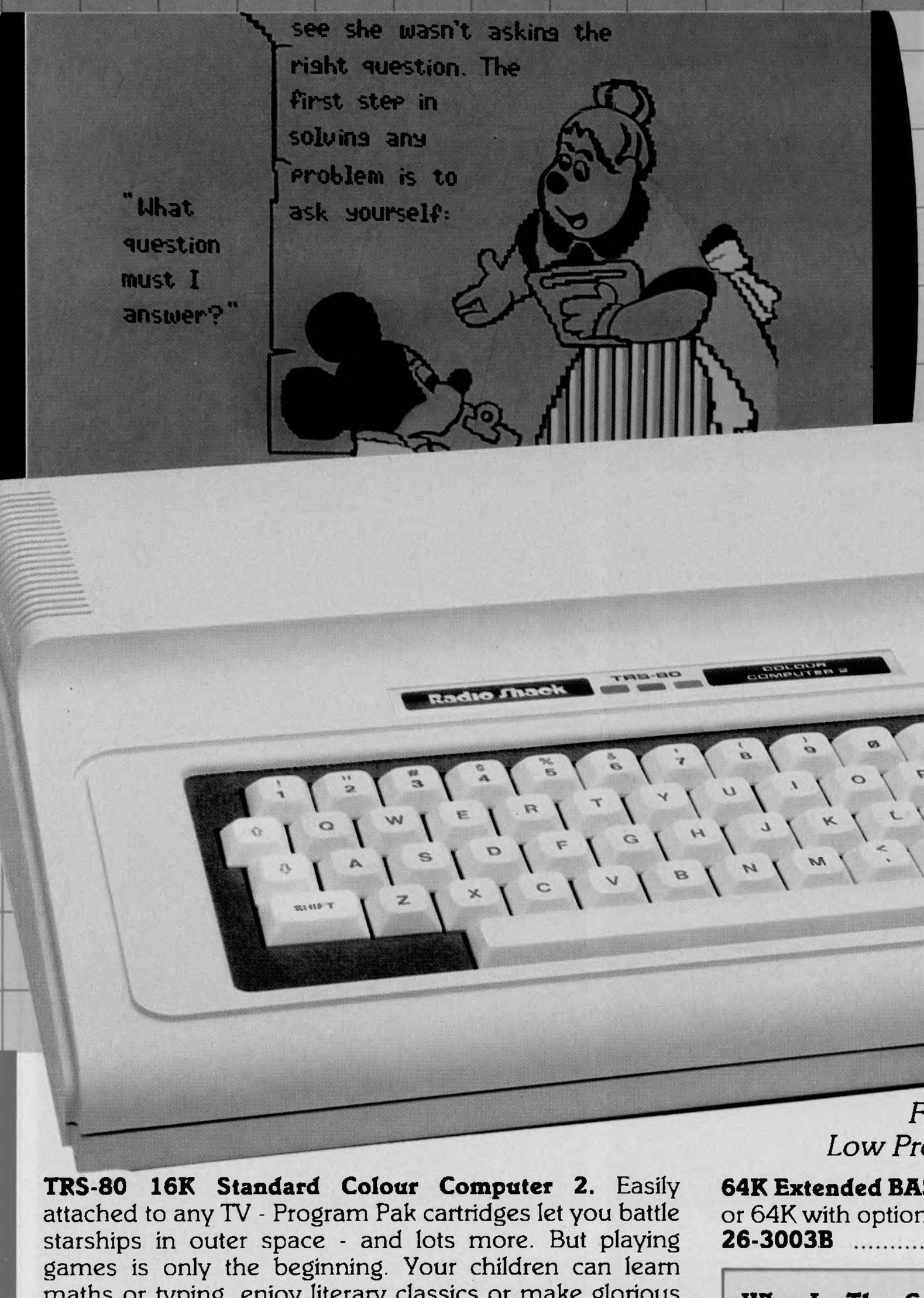

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HP150

The 150 from Hewlett Packard features the very latest in microcomputer engineering — a touch screen. Bearing in mind the company's hesitation in producing new products before closely examining its competitors' offerings, Peter Bright assesses this well-publicised machine: a gimmick or a vastly superior innovation?



Whenever Hewlett Packard (HP) releases a new machine you can rely on two things: 1) it will work; and 2) it will be expensive. HP's latest machine, the 150, seems to fulfil these criteria: it certainly works, but will cost you well over £3000.

If you have seen the television advertisement for the 150 you will know that its main selling point is a touch screen. Instead of pressing keys or moving mice to control the machine, you just wave your finger in the general direction of the screen and it will obey your every whim. To back up the screen, the 150 sports an Intel 8088 16-bit processor, 256k of user RAM and some ultra sharp graphics. But does all this justify the high price tag?

Hardware

The 150's main processor/display unit is extremely small. The main unit contains the VDU and touch screen,

processor, RAM and an (optional) internal thermal printer, all contained in a box measuring just 30 × 30 × 29 cms (approximately one cubic foot). In addition to the main processor/display unit the review machine also came with a very ugly tilt swivel unit, a floppy disk unit and a keyboard. All casings are made of high density plastic.

The 150 is well catered for as far as I/O is concerned. A look along the back panel shows that it has two RS232 serial ports and one HBIB parallel port. Both of the RS232 ports can be set under software control at speeds of up to 19,200 baud.

The HBIB was invented by HP (but is better known as the IEEE 488 interface) and allows up to seven devices to be daisychained onto one port. These devices can be printers, plotters, disks, lab equipment or any device conforming to the IEEE 488 standard. The only problem is that the 150 hasn't got a Centronics parallel printer interface so you may have to fork out more money and buy a RS232 card for your printer.

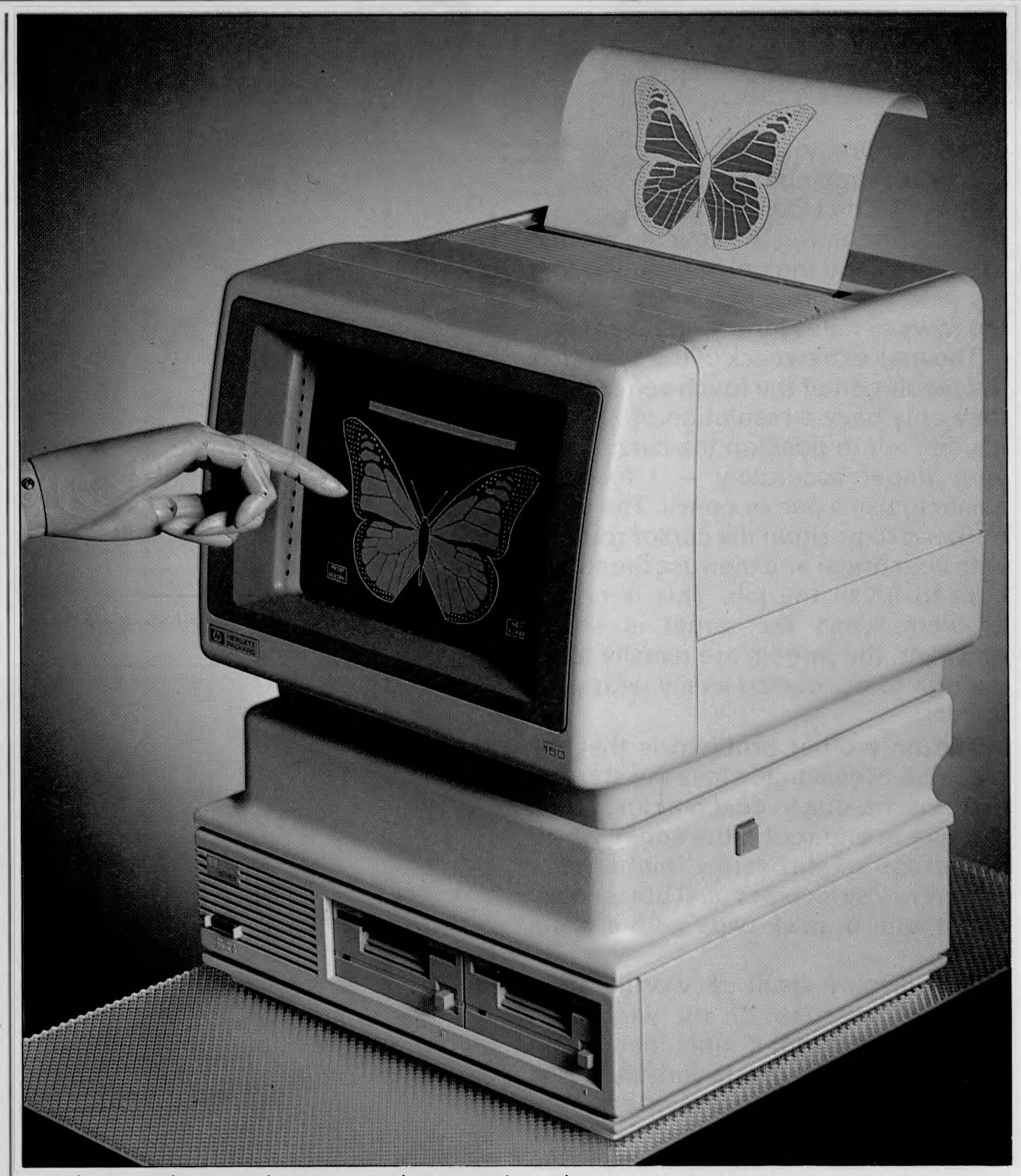
The rear panel also houses the on/off switch, along with a battery holder which takes two Duracell-type batteries to run the clock and the battery-backed CMOS RAM.

Inside the machine is a work of art. Virtually every available space within the casings has been used and every board is of the highest quality.

The main processor in the 150 is an Intel 8088, souped up slightly and running at 8MHz rather than the more usual 5MHz.

The entry level machine comes with 256k of user RAM. This is in addition to 60k of alpha and 32k of graphics video RAM used by the system. The user RAM can be expanded up to 640k by slotting in extra RAM cards. The 150 also has 256 × 4 bits of battery-backed CMOS RAM, which is used to hold the current default system settings — such as which keyboard character set you are currently using.

Most other business micros have 4k, or at the most 8k of ROM which is usually only used to hold the bootstrap operating system loader. The 150 has 160k of ROM, which not only holds the bootstrap but also diagnostics, terminal mode firmware, touch screen decoding firmware, and so on. The result is that much of the software the machine needs is already resident and does not need to be loaded from disk. This is most evident when the machine is in terminal mode, when the disks are unnecessary.



The innovative touch screen — just touch and go

The 150 is based on a bus architecture using a mother board and a number of daughter boards. The mother board has four slots, two of which are used by the processor board and the video controlled board.

The main processor board has a 256k RAM board and an RS232 board piggy-backed onto it. The two other slots on the motherboard can be used for extra 256k RAM cards.

All the PCBs are well made with no evidence of jumper leads or last minute changes. The power supply and the high voltage screen circuitry live either side of the tube.

Getting into the machine to change the boards is very easy. To reach the processor board and the video board, remove a cover on the back panel and slide the boards out. To get at anything else remove the top cover and/or the front cover: these come off easily by undoing two quick release screws on the top panel and a couple of snap-on connectors underneath the front panel.



The keyboard is excellent: 107 well laid out keys divided into four functional areas

Touch Screen

Whenever the screen is touched the machine can reason where your finger is and act accordingly. The operation behind this is very simple. Two banks of LEDs and photodiodes are arranged so that the light beams from the LEDs form a 23 × 40 matrix just in front of the screen. When you point at the screen your pen (or finger) will break one or more of the horizontal and vertical light beams. The machine works out where the intersection of the two beams is and

acts accordingly.

This arrangement works very well. The LEDs and photo-diodes are set into the cowling around the screen and the only indication that it's different from a normal screen are the rows of holes for the light beams.

The major drawback of the system is the resolution of the touch sensors. As they only have a resolution of 23 × 40 it's difficult to position the cursor with your finger accurately — I found it easier to use a pen or pencil. The other option is to position the cursor roughly with your finger and then use the cursor keys to finish the job. This is only a problem when the target is small: however, the targets are usually large enough to be located easily with your finger.

The only other problem is that the machine occasionally fails the start-up diagnostics, due to dust building up on the screen and round the edges which obscures the light beams. This happens with very low levels of dust but is easily cured with a quick wipe with a clean cloth.

The display itself is worthy of a mention because of its very high quality. Although it only has a 9in screen, the resolution is very sharp. All the characters are well formed and easy to read: the graphics are needle sharp.

The 150 has two display modes: 720 × 378 in alpha mode and 512 × 390 bit mapped in graphics mode. The screen displays 80 characters by 27 lines. Lines one to 24 are used in the same way as any other display, lines 25 and 26 are used to display eight touch-sensitive softkey labels and line 27 is a status line.

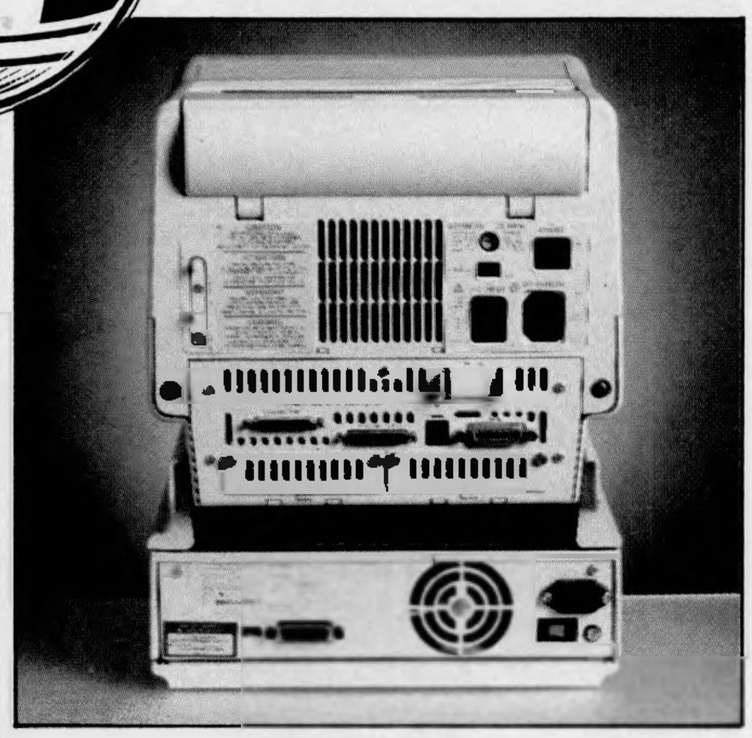
Each display mode is handled by its own hardware and software drivers which can be used independently and then mixed on the screen. The problem is that although both pages can be displayed on the screen at the same time, the data is held in two different areas of memory therefore screen dumps to a printer are difficult.

Disks

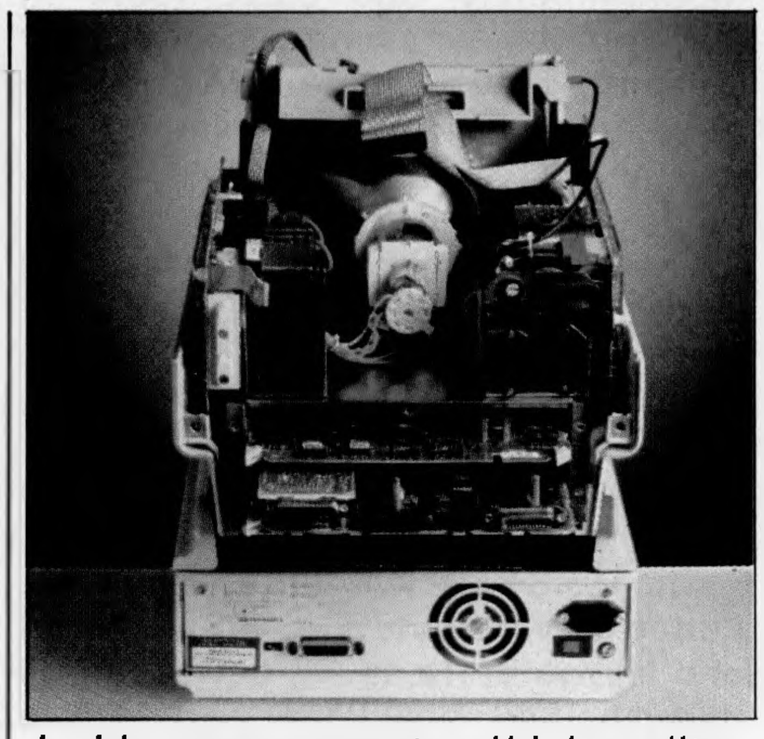
The review machine was supplied with twin Sony 3.5in 270k microfloppy disk drives, housed in a separate unit which needs its own power supply and has its own on/off switch.

HP has removed all references to Sony on the disks and has even been cheeky enough to print its own name on the shutters in place of the Sony logo.

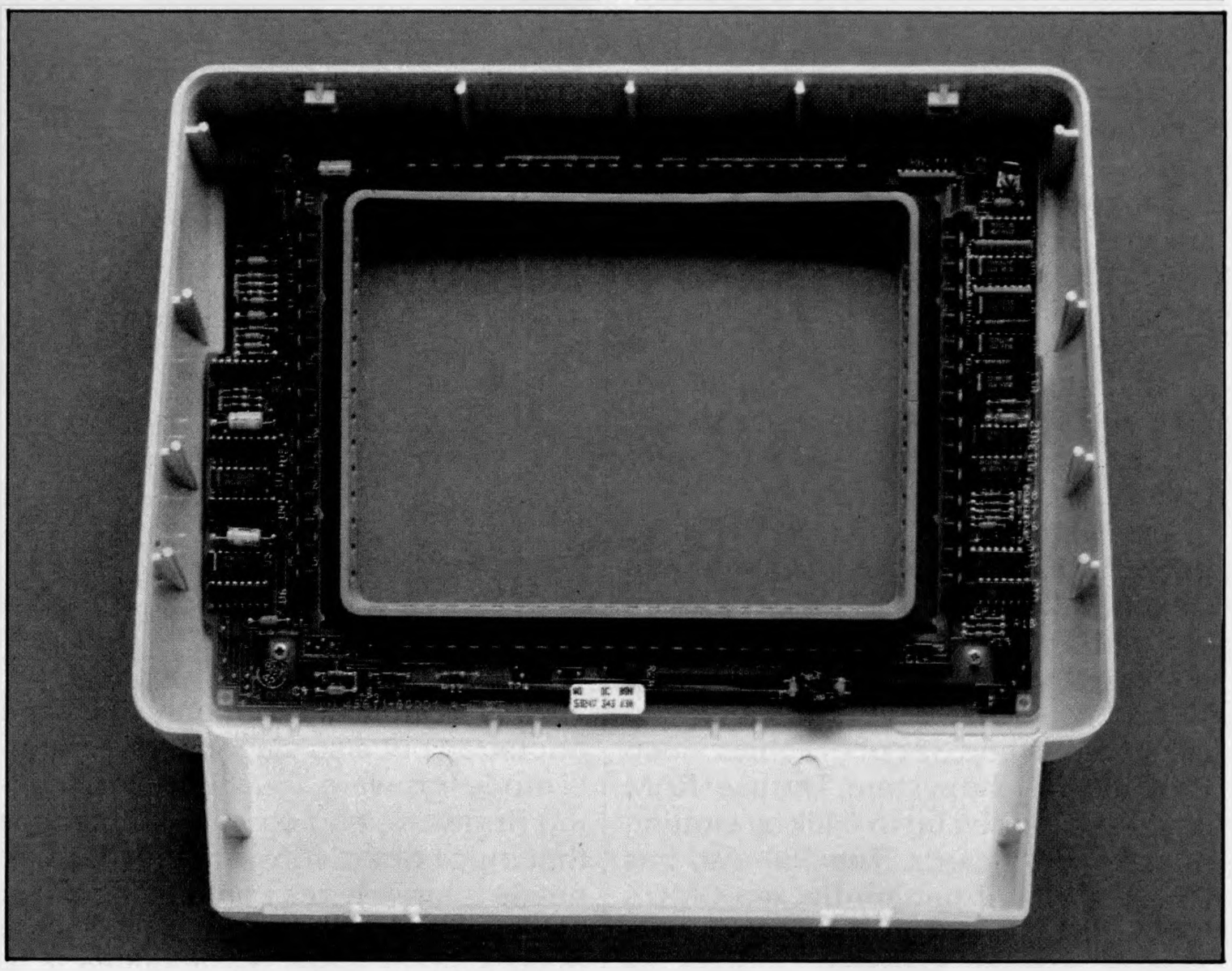
While I was testing the machine one of the drives went down. It took an HP engineer just 10 minutes to replace it. The drive unit is connected to the main unit via the HPIB interface. The advantage of this system is that it is very easy to hook up hard disks or 8in or 5.25in floppies so long as they conform to the HPIB standard. I have no complaints about the disks other than they are occasionally slow; it's difficult to know



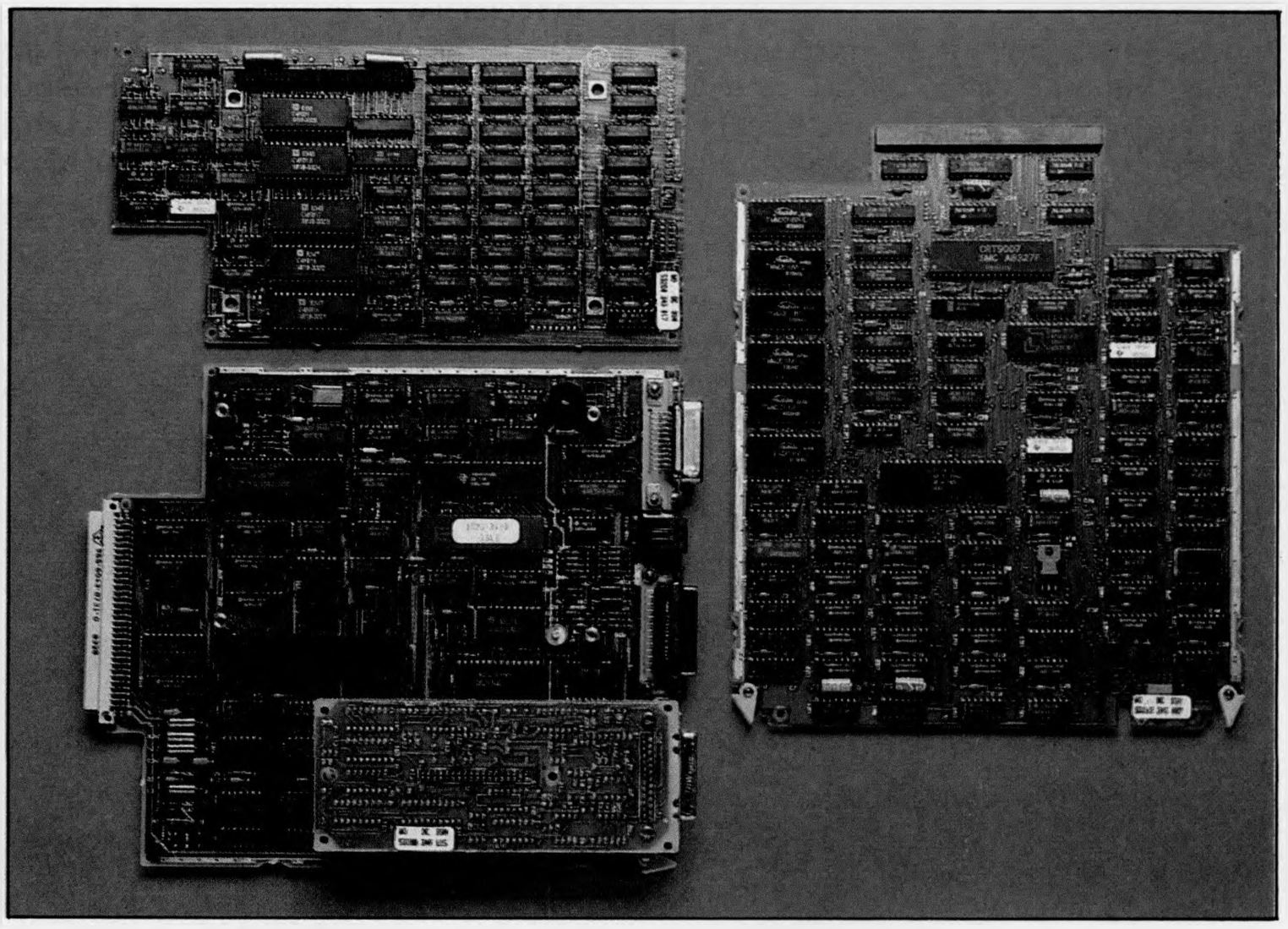
Input/output ports are well supplied



Inside: very compact and high quality components



The HP150 is based on a bus architecture using mother and daughter boards



The PCBs are well made with no evidence of jumper leads

whether this is the fault of the drives or the Personal Applications Manager (see below).

The review machine was supplied with an integral 80 character thermal printer built into the top cover of the main unit. I am not a great fan of thermal printers — this one prints in a strange light blue colour — but it served its purpose.

Keyboard

This is the widest unit of the whole machine. In fact, it looks rather out of place because the rest of the machine is so compact. It's connected to the main unit via a coiled cable and a BT-style multi-way plug, and can be made to tilt upwards by pulling down a flap on the back.

The keyboard holds a total of 107 keys divided into four functional areas. To the left hand side is the main qwerty typing section laid out in a standard manner. The only extra keys not normally found on a computer keyboard are two labelled EXTEND CHAR. These are placed at either side of the space bar and are used to produce continental characters.

When the CAPS LOCK key is pressed the word CAPS is displayed on the screen's bottom status line to show that it has been engaged. This is infinitely preferable to the LED indicator on most other micros.

To the right of the qwerty section is the screen handling and editing section. This contains all the usual cursor control keys along with keys to insert and delete characters and lines of text. To its right is the numeric keypad.

Running along the top of the keyboard are eight programmable function keys plus various assorted machine control keys. The function keys are perhaps superfluous simply because they duplicate the touch-screen softkeys.

The other control keys on the top line are BREAK, STOP, MENU and SYSTEM. The BREAK key performs either a hard or soft reset, the STOP key is only usually used when the 150 is in terminal mode but can also be used in shifted mode to take the machine from terminal mode back into being a computer. The MENU and SYSTEM keys control the touch screen softkeys.

In company with most other 150 features the keyboard is 'soft'. Perhaps a better term would be 'firm' as all the character sets are controlled by ROM-based firmware. The firmware supports 16 different European character sets and also allows the audible key-click to be switched on or off.

The keyboard is the best I've ever used. It's well laid out and every key has a light, positive feel which makes it very easy to use.

Software

The 150 runs under MS-DOS version Z, but it's unlikely that the average user will ever see the MS-DOS command prompt: HP has put a friendly front end onto MS-DOS which it calls the Personal Applications Manager (PAM). Whenever the machine is switched on, it first loads MS-DOS from disk and then goes on to load PAM.

First of all, PAM reads both disks to look for installed applications and displays the names on the screen. If you have a WordStar disk in drive A and a VisiCalc disk in drive B, they would be displayed as two boxes on the screen.

To select VisiCalc, touch the VisiCalc box. This will then be displayed in double intensity to show that you have selected it. If you change your mind, touch another box and it will be selected. To run the program, touch the START APPLIC softkey at the bottom of the screen.

The use of softkeys means that a program can be selected and run by pointing a finger at two boxes — much easier than typing the program name and hitting CR.

Built-in functions

PAM has six built-in functions selected by touching the softkeys at the bottom of the screen. The first is START APPLIC as mentioned above. In addition, it's possible to set the date and time, reread the disks, play with files and directories, enter terminal mode and look at the help screen.

REREAD DISKS. If the disk drives are changed PAM will need to be informed. PAM will then reread the disks and redisplay the installed application.

FILE MANAGER. This lets you explore files and directories. You can display a directory, change to a new directory, look through the contents of a (ASCII) file and copy or rename files.

When in file manager the contents of the current directory are displayed on the screen. You can then touch the file(s) you wish to work on. If, for example, a file is to be deleted from the current directory you would touch the DELETE FILE/DIR softkey, touch the file to be deleted (which would then be highlighted), then touch the START DELETE softkey. All this is achieved without ever having to use the keyboard. If you make a complete mess of the operation, touch the START OVER key and start again.

TERMINAL. The 150 has some very extensive terminal facilities which allow it to be hooked up to a range of mainframe machines. All the terminal software is held in ROM so the disks are never used. To upload or download diskfiles use a comms package when the machine is in computer mode.

Both the RS232 ports can be configured under software control by touching the CONFIG KEYS softkey. The settings are held in the battery-backed CMOS RAM and are retained when the machine is switched off.

When it is shipped from the factory the 150 comes with two sets of default settings: 1200 baud full duplex hard-wired and 300 baud full duplex modem. Not only can the normal data bit/stop bit/parity settings be used, but protocols such as HP's EnqAck handshaking can be set and pins can be high or low.

The system defaults are also set in terminal mode, such as keyboard type and the printer port. You can also set the printer to echo everything that is displayed on the screen, which is handy on a service like Telecom Gold where hardcopy of messages is needed.

I tried the terminal mode on a wide range of dial-up services using an acoustic coupler and it worked very well — the ability to produce hard copy of current applications is very useful. In order to get from terminal mode back into computer mode press the shift and stop keys together.

HELP. If you get lost, touch the help softkey and the machine will display a one page help screen giving a potted description of each function.

In addition to the utilities directly available from PAM, there are a number of disk utilities which can be called from PAM as programs to make life easier:

FORMAT. To format a disk, touch the FORMAT box followed by the START APPLIC box. You are then faced with a list of drives from A to L. To format the disk in drive B touch the B box. The system will then ask for the disk name.

This utility does more than just format a disk. Eight-inch disks can be formatted to IBM 3740 format or standard HP format. If the formatted disk is to have MS-DOS system tracks, the format utility will copy them over. Finally, to wipe the files off a disk, touch the CLEAR option. This is much faster than using the full format option.

COPY/BACKUP. When selected this requests the name of the drive you are copying from and the drive you are copying to. You then choose whether to copy or backup your files, or copy to CP/M format (only copy to CP/M format if there is another HP machine available running CP/M and data is to be transferred.

The difference between copy and backup is that copy produces an exact replica of the original files, whereas backup stores its data in a compressed

'The touch screen is vastly superior to the mice that are breeding in the rest of the micro world . . . no messing around on the desk trying to get the cursor to go where you want it to — just point and go.'

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format. Files created using backup can't be read directly: they have to be reconstructed first.

To select the files to be copied touch the names that are displayed on the screen. Alternatively, you can select by using wild cards or the date that the file was last written to. This is very useful if you are regularly backing up files and only need the most recent version.

INSTALL. PAM will only pick up and display an applications program if it has been properly installed into the system. The install utility will copy an application onto a system disk, and install it so that it is recognisable by PAM.

Install works by looking across the disk for files with the extension IN$. All programs supplied by HP come with a IN$ file but if you have written the application yourself one will have to be created. By using a text editor or word processor a file is produced in the following form:

General form	**Example**
Display name	Myprog
Version no	1.2
Program name	BASIC.COM
MS-DOS command line	MYPROG.BAS
Program size (bytes)	128
Names of all files used by the program	BASIC.COM MYPROG.BAS

MS-DOS COMMANDS: These get you down into MS-DOS command mode complete with the A> prompt. I can't see any reason why you would want to do this — PAM is much better at most jobs.

Applications software

The review machine was supplied with four applications packages — VisiCalc, Graphics, Basic and a word processor called Memomaker. As the 150 runs under MS-DOS there is a wide range of software available but not all of it will work with the touch screen. Products like WordStar and Multiplan have been converted: dBase II and Lotus 1-2-3 will run but have not been converted for the screen.

VisiCalc has been modified to run on the 150 with the touch screen. It's much the same as any other VisiCalc except that you can move directly to any cell just by touching the screen. All the softkeys along the bottom of the screen are configured for VisiCalc. The only problem I had was that one touch resolution is not fine enough to reach the required cell straight away. I found the best method was to drag my finger across the screen and then pull it away when the cursor reached the desired cell.

The graphics are very good. The output is very sharp due to the high screen resolution. Using the graphics programs bar charts, line charts, pie charts and text in any combination of nine fonts and eight sizes can be created. The only problem is that the graphics programs are supplied on no less than five different disks (somehow I always managed to lose the one I wanted).

Memomaker is an excellent little word processor. As its name implies it is not designed for 'heavy' word processing (this is better left to WordStar) but is simple to use and easy to learn.

All the necessary functions are displayed on the softkeys so you don't have to remember any complicated command structures. Also, the files produced are fully compatible with WordStar, so documents can be exchanged between them.

Two good features of Memomaker are that standard memo formats can be saved on disk and then recalled later, and emphasised printing, such as bold, is displayed on the screen.

Basic is a great let-down. In order to try to keep the machine standard, HP has used standard Microsoft Basic on the 150 which is totally out of keeping with the rest of the machine. It isn't interfaced to the touch screen — you have to use the keyboard! To write a Basic program to access the touch screen, unfriendly escape sequences must be used which detract from the readability of the programs.

Documentation

The documentation is very good. Six manuals were supplied with the review machine — a computer users' guide, a terminal users' guide and one manual for each of the applications. All were supplied in boxed, ring-bound folders with inserts to show where each section started. All were properly typeset and printed rather than the photocopied manuals I normally receive.

The manuals are well written: a brief list of all important points is printed at the start of each section followed by more detailed examination of each point. They're easy to read and informative.

Prices

The entry level machine with twin 3.5in disks and 256k of RAM will set you back £2995 plus VAT. The internal printer costs an extra £380. Extra RAM costs £627 for 256k.

The 150 is not cheap but then HP doesn't go in for cut-price machines. It's main competitors are the likes of the Apple Macintosh and the IBM PC and both these machines are roughly £1000 less than the 150.

Conclusions

When I first saw the 150 I thought the touch screen was a gimmick — just HP's way of getting on the 'friendly' micro bandwagon. HP has a reputation for being a counter-punching company: it waits to see what other companies are doing and then brings out a product based on those ideas. In general terms this is what HP has done with the 150: it has seen the likes of Apple producing easy to use micros and has come up with a 'friendly' product of its own. However, the touch screen sets this machine apart from the rest of the micro crowd.

The touch screen is vastly superior to the mice that are breeding in the rest of the micro world. The problem with using a mouse is that you need to keep a portion of your desk clear so that it can roam freely, and it needs a special surface so that it doesn't slip.

The touch screen means no messing around on the desk trying to get the cursor to go where you want it to — just point and go. The only drawback is that it isn't as accurate as the mouse, so the screen can't be used to draw such detailed pictures.

At first sight, the 150 looks overpriced. Its major competitor is the Apple Macintosh at nearly £1000 cheaper, but a look at the way the 150 is put together reveals where the extra money went — it's one of the best engineered micros I have ever seen.

All in all, the 150 is a well-built, easy to use micro. Whether you include it on your shopping list depends on whether you consider that the quality justifies the extra cost. I think it does.

END

Benchmarks

BM1	1.4
BM2	4.3
BM3	8.7
BM4	7.5
BM5	10.3
BM6	18.4
BM7	28.1
BM8	26.7

All timings in seconds. For a listing of the Benchmark programs see 'Direct Access'.

Technical specifications

CPU	Intel 8088 running at 8MHz
RAM	256k user RAM expandable to 640k 60k alpha system RAM 32k graphics system RAM 256 × 4 bits battery-backed CMOS RAM
ROM	160k
I/O	Two × RS232 Serial ports, one HPIB (IEEE 488) port
Screen	9in green monitor with 23 × 40 LED touch sensors

Oric/Atmos

Surya continues his analysis of the machines on the PCW Convertor Chart with a look at graphics and sound capabilities on the Oric-1 and Atmos microcomputers.

The Oric-1 is a low-priced micro with sound and colour, competing mainly with the Sinclair Spectrum. The Oric Atmos is the same machine in a different box, with a ROM that works and a higher price tag. It has an extra key, FUNCtion, which doesn't do anything, but looks pretty. Throughout this article, I'll refer to both machines as the Oric.

The Oric has four screen resolutions, or modes. These are TEXT, LORES 0, LORES 1 and HIRES.

TEXT

Text mode is primarily intended for displaying text. The text screen is 40 columns by 26 lines, though the two left hand columns are reserved for escape sequences. The origin, as for the other modes, is the top left. Besides PRINT, the other display statements supported in text mode are TAB, INK, PAPER, PRINT@ and a number of escape sequences.

TAB does not work on the Oric-1, but the bug has been corrected on the Atmos ROM. As columns 0 and 1 are reserved for ESCAPE sequences, the PRINT cursor is already at column 2. TAB(0), (1) or (2) has no apparent effect.

INK and PAPER set the foreground and background colours respectively. The colours are set using INK n and PAPER n, where n is in the range 0-7:

0 Black
1 Red
2 Green
3 Yellow
4 Blue
5 Magenta
6 Cyan
7 White

PRINT@ is used to print items to specific screen coordinates. The format is PRINT@ x,y, where x is the column position (2-39) and y the line (0-26). The x coordinate starts at 2 because columns 0 and 1 are reserved for escape sequence attributes.

Escape characters are used to achieve special effects. There are 24, @ then A to W inclusive. When a series of escape characters is executed, this is known as an escape sequence. An escape sequence affects only the current line, so it must be suffixed by a semicolon. The standard escape sequence format is PRINT CHR$(27);"<escape character>"; [CHR$(27);"<escape character>"; . . .]. The escape characters supported by the Oric are:

ESCAPE	@	Set INK to Black
	A	Red
	B	Green
	C	Yellow
	D	Blue
	E	Magenta
	F	Cyan
	G	White
	H	Select standard character set
	I	Select alternate character set
	J	Standard double-height
	K	Alternate double-height
	L	Standard flashing characters
	M	Alternate flashing characters
	N	Standard double-height flashing
	O	Alternate double-height flashing
	P	Set paper to Black
	Q	Red
	R	Green
	S	Yellow
	T	Blue
	U	Magenta
	V	Cyan
	W	White

Thus, PRINT @18,13; CHR$(27); "A";CHR$(27); "W"; CHR$(27); "N"; "PCW" will print 'PCW' in double-height flashing red characters on a white background.

We can set individual lines of the display to different colours and other attributes. In this way, more than two colours are displayed on the Oric screen.

LORES 0

The LORES mode has an identical screen resolution to the text mode. In this mode, all characters are PLOTted rather than printed to the screen. The format is PLOT x,y,<character>. PLOT can only display strings to the screen, so STR$ is used to display figures (for example, PLOT 0,0STR$(a)).

Unlike PRINT or PRINT@, PLOT allows us to display inverse characters by specifying (ASCII code of the character + 128) as the character to be plotted. For an inverse 'PCW':

```
 99 REM With apologies to Ian!
100 NORM$="PCW": INV$=""
110 FOR A=0 TO LEN(NORM$)
120   INV$=INV$+CHR$(ASC(MID$
        (NORM$,A,1))+128)
130 NEXT A
140 PLOT 18,12,INV$
```

Note that 'inverse' refers to logical rather than physical inverse. The foreground colours are not swapped around but the value of the colour is subtracted from seven, so the logical inverse of blue (4) evaluates as (7−4=3) (yellow).

SCRN is the complement of PLOT. SCRN (x,y) returns the ASCII code of the character displayed at the specified position. SCRN is also useful for testing the current attributes of a specified line by testing columns zero and one.

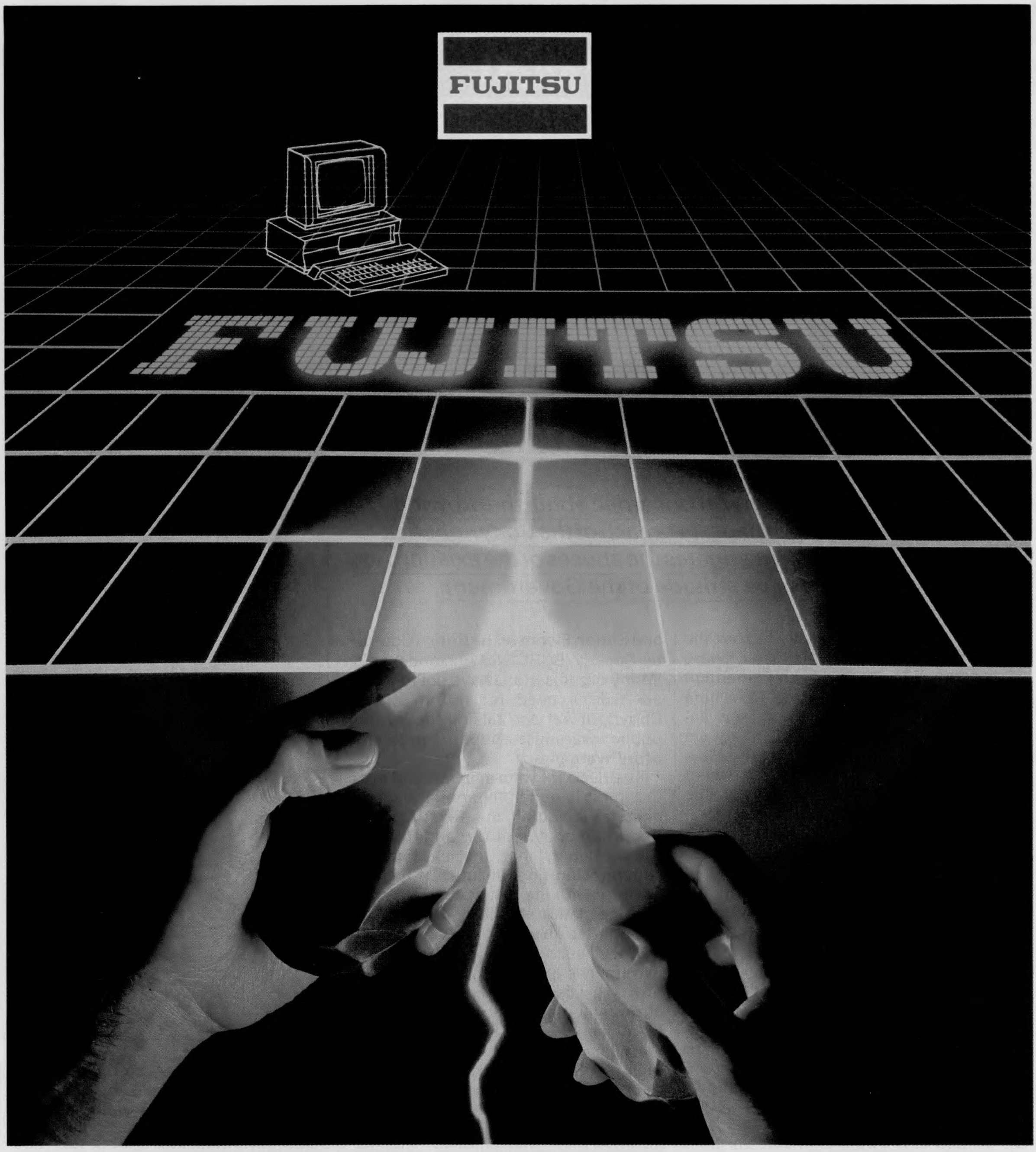
LORES 1

LORES 1 is actually identical to LORES 0 except that the default character set is the alternate (graphics) rather than standard (ASCII). The alternate character set consists of block graphics characters.

Although LORES 1 has an identical resolution to LORES 0, it's possible to address the screen as if it had a resolution of 80×81. This is achieved by POKEing parts of the block graphics character into video RAM. This technique is easily spotted in Oric listings, as the addresses of the video RAM are &BB80 (which the Oric knows as #BB80) to &BFDF (#BFDF), or decimal 48000 to 49119. If a program appears to be plotting to an 81×80 resolution in LORES 1 mode, just look for POKEs to these addresses. When converting the program, omit the POKE section and choose a graphics resolution on your own machine as close as possible to 80×80.

END

Next month: Oric HIRES mode, sound capabilities, and a listing of the complete character set.



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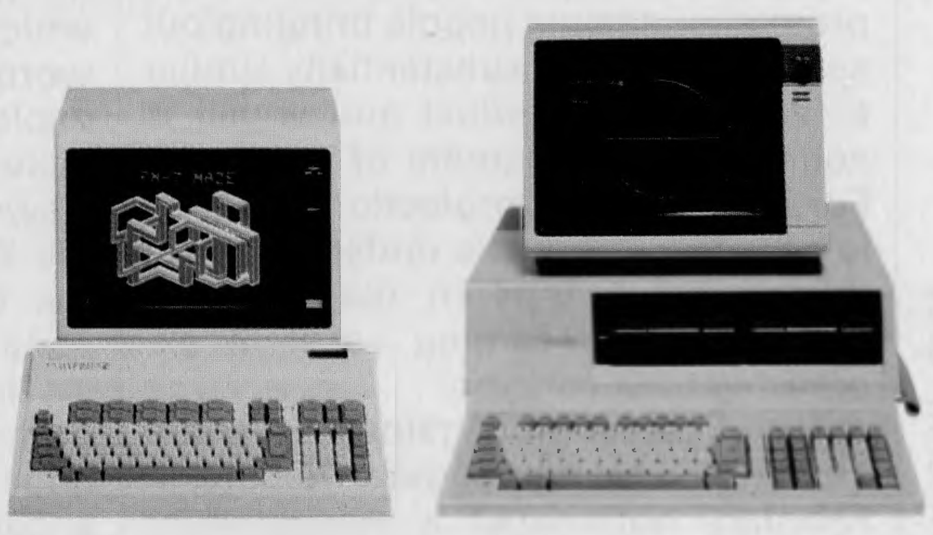

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Breaking the law?

Software producers are concerned about the growing practice of piracy in flagrant breach of the Copyright Act. Margaret Spooner investigates the abuses of the existing Act and the passive attitude of the Government.

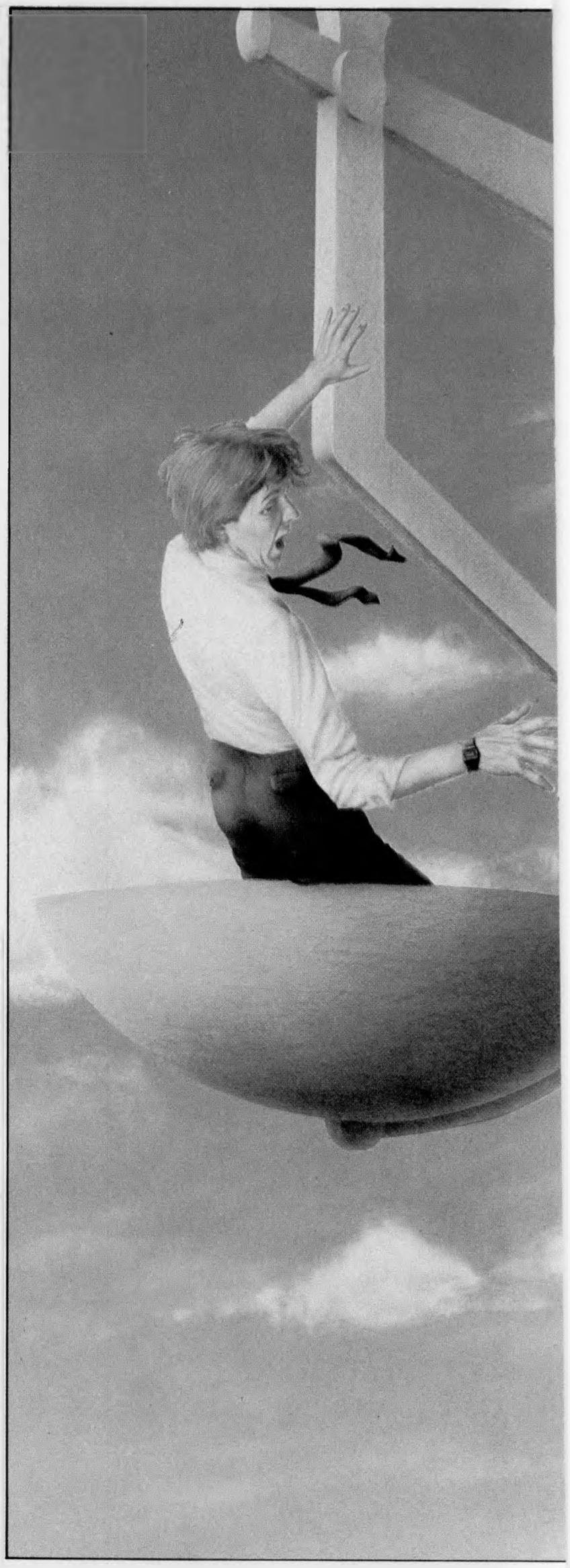


Illustration by Andrew Farley

A group launched recently to alert the public to the problems of software piracy will put pressure on Parliament to reform the Copyright Act to include computer software. As piracy increases, so does the need for adequate protection through both copyright law and other means. Even so, as we went to press one attempt to make available a method of protecting programs on tape was held up by the Ministry of Defence and the Patent Office because it could be a UK security risk.

Jim Lamont of JLC Data claims his invention is 100% secure but was legally bound not to talk about it while the matter was considered. Frustrated by the delay, he has brought out an alternative method of protecting software which he says will prevent 90% of casual tape to tape copying — it is a hardware device, but this time he has not applied for a patent and will therefore go ahead with marketing it. He says that Bibi Magnetics will handle licences for the method.

There is obviously a need for such devices to protect software from being directly copied, but they do not provide protection against people bringing out software which is substantially similar to an existing product and which is equally an infringement of copyright. For such cases, the protection of the law is necessary and it is understandable that many groups in the software industry are becoming vocal in expressing their concern.

The Federation Against Software Theft (FAST) at its inaugural meeting in February nominated a management committee to prepare for its launch. It consists of Nick Alexander of the Guild of Software Houses, Ronald Robertson of the Computing Services Association and Simon Elsom of the British Computer Society (BCS). Nick Alexander said: 'Many organisations have got together and see a need for reform of the Copyright Act *and* raising the level of public awareness about the problems of software piracy.'

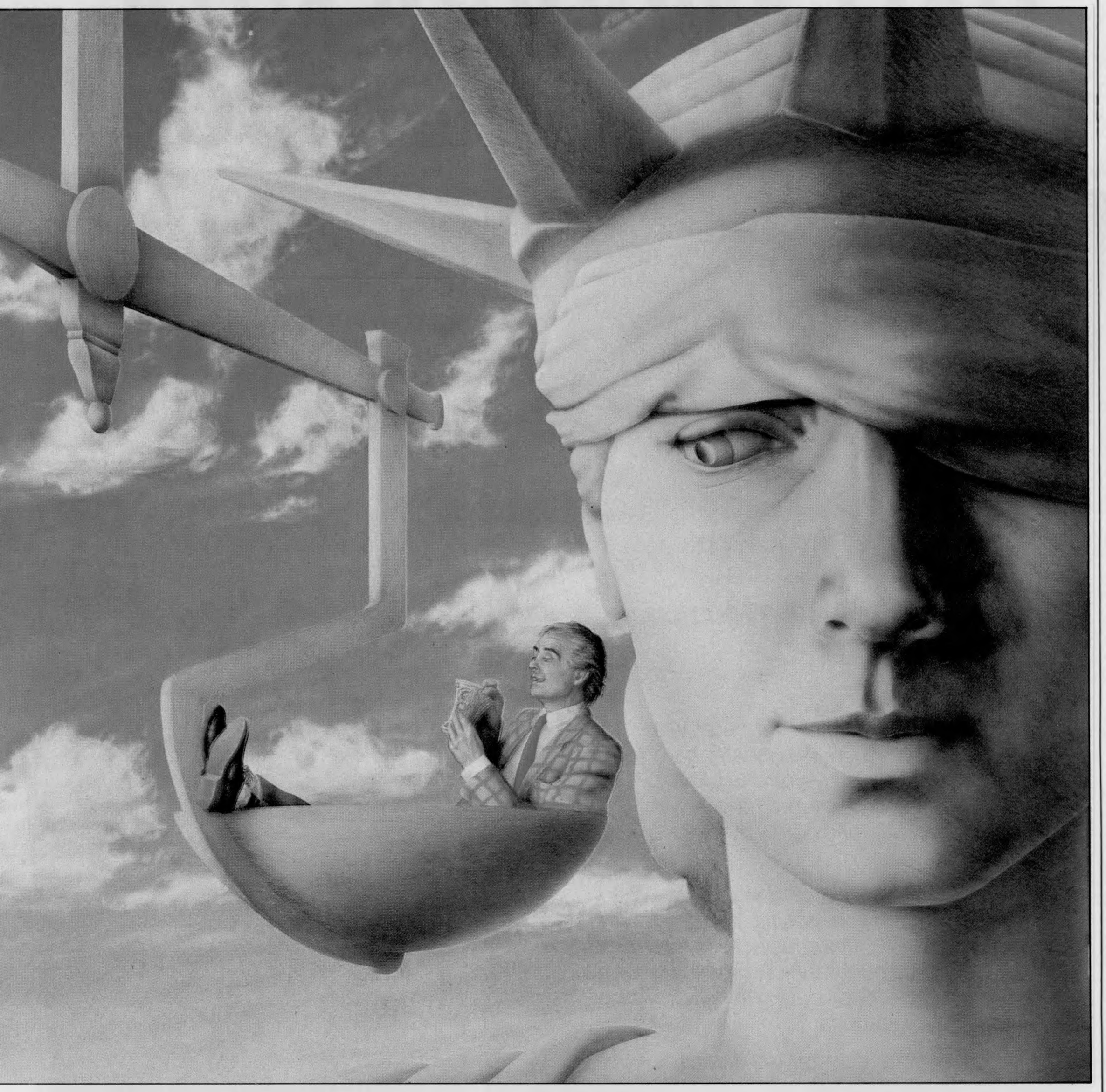
The need for reform is realised even though it is generally agreed by legal experts, including the 1977 Whitford Report on copyright law and the 1981 Green Paper, that the existing UK copyright law does include software by analogy with literary works. However, until legislation establishes the fact it is still open to question.

While such doubt remains, it is extremely expensive for a company to take a case of software copyright infringement to trial because of the many issues which have to be argued and the uncertainty of the final result. So far, in the UK, companies wishing to prosecute an infringement have settled at the interlocutory stage (see 'Communications'). 'An interlocutory application is an application for an injunction which never goes further because it's effective enough to stop the action which caused the complaint — in other words, an out of court settlement,' explained Ann Staines. Ann is senior lecturer in the School of Law at Newcastle Polytechnic, a member of the BCS Copyright Committee and of the Council of the Computer Trade Association (CTA).

'These settlements are useful for putting us on the wavelength of judges about which way a decision would go if a case was brought to trial — but without a trial there's no precedent,' she said.

Legal precedents do exist in other countries. In South Africa in April 1982, in *Northern Office Micro Computers v Rosenstein*, it was held that in South African law, which is similar to UK copyright law, software is subject to copyright provisions. And in the 1983 *Apple v Franklin* case a United States Appeals Court ruled that Apple holds the copyright in its software including operating system software held on ROM chips. An opposite decision was brought more recently in an Australian court in the *Apple v Wombat* case but this could be reversed on appeal.

Apple has consistently taken a tough line against infringers. *PCW's* US correspondent reported in March that Apple has about 50 copyright infringement cases pending in 16 countries. The company's most recent victory occurred on 28 February when the US International Trade Commission (ITC) issued an exclusion order to prevent imports of computers infring-



ing Apple's patents and copyright programs. This is subject to a 60 day presidential review but President Reagan has very seldom disapproved an order. ITC's official spokesman says that the US has a provision in its customs laws for companies to register their copyrights with customs to enable customs officers to seize counterfeit imports, and they regularly do. But tough measures in other countries provide an example which the UK Government may only choose to follow if it is convinced that there is cause for serious concern.

'These are not precedents in UK law but do serve as guidelines,' said Ann. 'However, unless points that cause concern are argued out we are acting on assumptions. It would be useful if the Copyright Act were amended so no-one would have the expense of a full action to settle the issues. The BCS is in no doubt that the law does cover software but wants it settled in legislation.' To this end, the BCS Copyright Committee has drafted a Private Member's Bill which it hopes will go through in this session of Parliament, but such hopes are likely to be dashed despite the Government's stated intention to provide copyright protection for software.

The Copyright Act (1956) provides a restraint on others from copying an original work: copyright on the work lasts for 50 years after the death of the author. In the UK, an original work automatically acquires copyright protection if its author is a qualified person: that is, a UK subject or a body incorporated under UK law. The UK is a signatory of the Universal Copyright Convention so UK subjects obtain reciprocal copyright protection in other member countries according to those countries' copyright laws. The UCC requires a copyright notice on the published work: C within a circle, the name of the proprietor of the copyright work and the year of publication. The notice should appear in legible form on the first page of the publication or on the back of the title page.

Copyright infringement

In a statement issued last year by the Computer Retailers' Association, Anthony Harding outlined the restrictions enforced by the present act:

a) Reproducing a work in any material form.

b) Publishing the work.

c) Making an adaptation of the work.

The final item means that a subroutine written by one author cannot be included in another author's program without permission. He adds that the first restriction has caused the most

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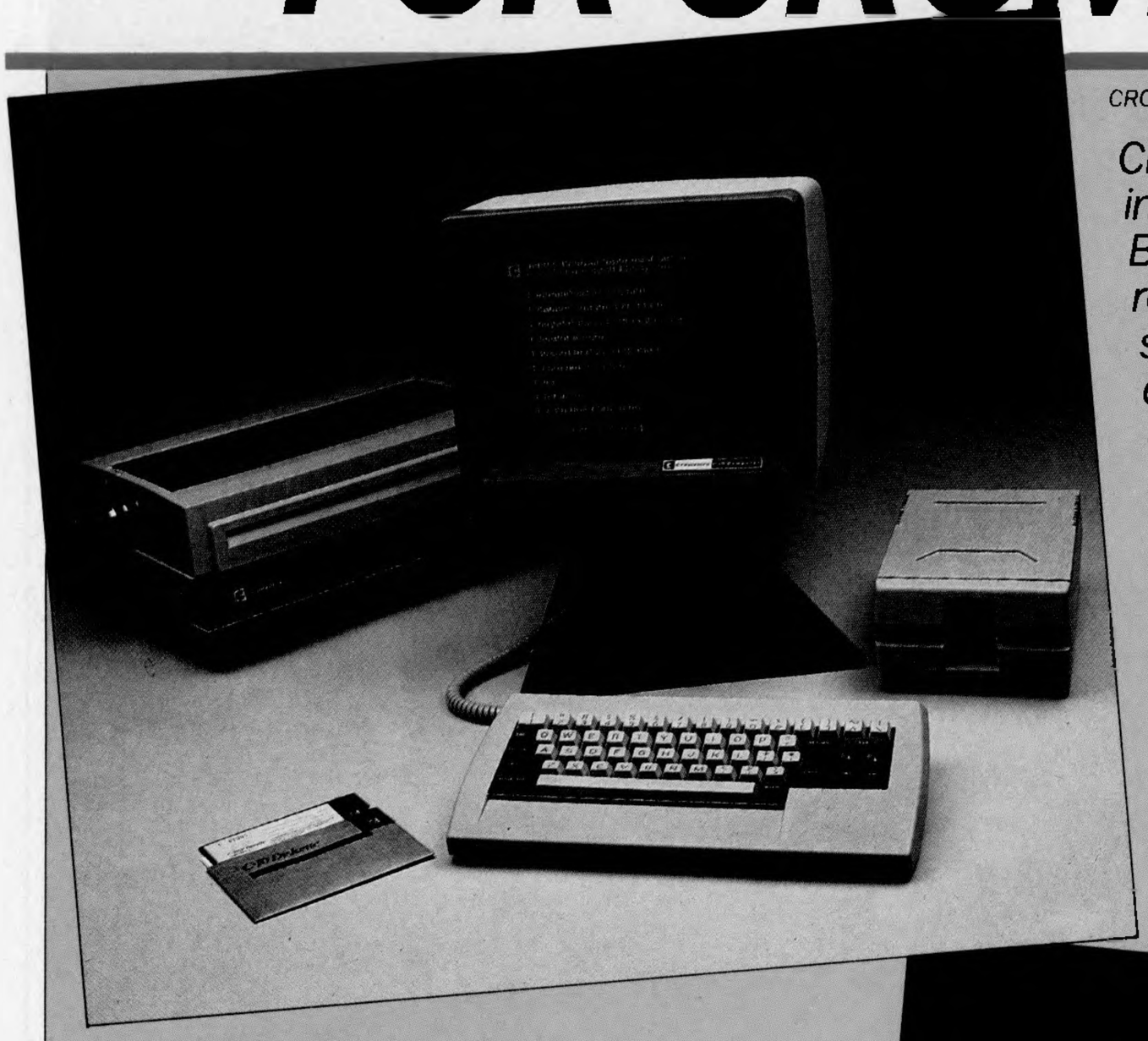


CROMEMCO C-10MP

Cromemco's C-10 personal computer includes a Z-80A microprocessor with 64K Bytes RAM, 24K Bytes ROM, high resolution 12" green phosphor 25 x 80 screen, detached keyboard, 5" floppy disk drive with 390K Bytes capacity, communications and printer ports, terminal emulation, graphical characters, CDOS operating system and 32K Structured Basic.

In the C-10MP we add a software "Super Pak": a full screen editor, WordStar, MailMerge, Writemaster, CalcStar and PlanMaster spreadsheet programs, Chess game, MoneyMaster financial analysis and InfoStar data base management system.

The System One Hard Disk computer, with an integral 21 Megabyte Winchester hard disk, includes Cromemco's dual 68000/Z-80A DPU processor (featured below), with 256K Bytes of RAM and 390K Bytes of floppy disk storage.

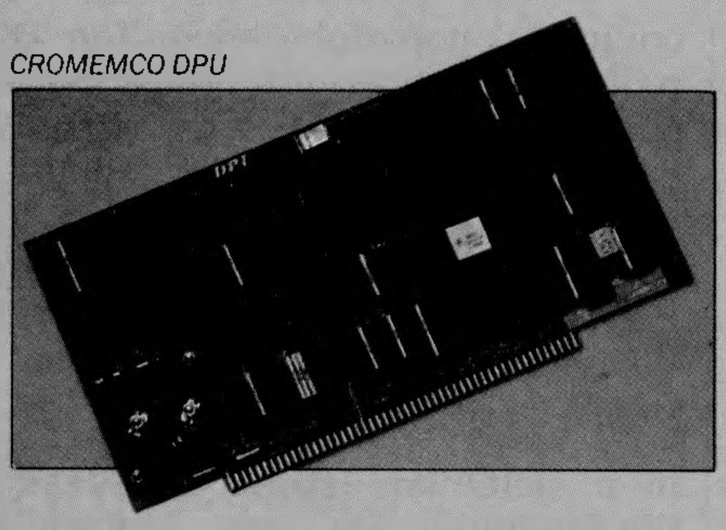
The S-100 bus has eight card slots, sufficient for expansion utilising Cromemco's range of interface cards for high resolution colour graphics, process control, analogue-digital data conversion and telecommunications.

A choice of operating systems includes CDOS, CP/M and CROMIX.



CROMEMCO CS-1HD2

CROMEMCO DPU



Cromemco's Dual Processor Unit is the ultimate professional micro-computer. It combines the flexibility of Z-80A 8-bit systems with the speed and versatility of 68000 16-bit technology and an address space of up to 16 Megabytes of RAM.

The DPU can be installed in several Cromenco computers, including the CS-1 featured above. For larger applications we recommend the CS-2, with up to 4 floppy disk drives, each of 390K Bytes capacity, an optional 21 Megabyte Winchester hard disk, screen and printer interfaces plus a 21 slot S-100 bus – sufficient capacity to cope with the most demanding industrial or laboratory requirements.

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SOFTWARE COPYRIGHT

problems, in particular whether or not the work is reproduced in a material form when loaded into computer memory.

The statement continues: 'There is one common misconception regarding infringement and that is that a would-be offender has to set up in the business of pirating in order to infringe. In other words, he has to make money out of the transaction. This is not so. The Act makes ample provision and specifically states that infringement takes place even though the offender is not infringing for purposes of trade.'

So, if you've ever copied a game to give to a friend you were breaking the law.

'When it comes to schoolchildren copying games there is little in the way of enforcement,' says Ann Staines. 'It is difficult to know that copying is taking place and enforcement could mean infringing their right to privacy.' But Anthony Harding points out: '*Theoretically*, a customer who copies his Invaders to give to a friend is just as likely to find himself sued as is the company which specifically sets out to rip off a major accounting system for profit.' The damages would be different but they will both have to pay costs.

To take advantage of the protection offered by the Copyright Act a plaintiff must be able to provide evidence, both of his owning the copyright and of the infringement.

As well as copyright marking, a further method of proving ownership of copyright has recently become available in the UK — a software register has been established by the CTA. Nigel Backhurst, the CTA's general secretary, says that its aim is to set up a standard numeric coded form for registering software, similar to the international standard book number system. 'This will provide independent proof of when a piece of software was created, because a lot of the present methods are not reliable for evidence when a case comes to trial. The register is intended to be used in addition to other methods,' he said.

Proving an infringement

To prove an infringement of copyright, strong evidence is needed. Software protection expert Simon Elsom says that a plaintiff has to be able to provide, at least, a copy of his documentation showing a substantial similarity between his documentation and the copy and, if possible, produce a copied disk. One way of ensuring that such evidence will exist is to insert hidden copyright notices in your program. 'If an intruder wishes to remove these he can,' said Simon, 'but it can take a long time to disassemble and patch a program and look at whether this has changed any other bits of the program.' Obviously, if it takes too long any market advantage the software pirate may have will be lost, so most software pirates don't bother to remove internal copyright notices. 'For example, in the *Apple v Franklin* case hidden copyright notices were found in the Franklin software,' said Simon.

Even if such precautions are taken, obtaining evidence of infringement can still be difficult. 'If you warn the infringer that you're going to prosecute he may burn documentation and other evidence. To prevent this you can go to court on your own and, provided you convince the judge that someone is pirating and there's a chance he will destroy the evidence, you can get an order from the court for your solicitor to search the premises for evidence — it almost amounts to a civil search warrant.' This is an Anton Piller Order. 'The court is wary of giving them as it is an extremely powerful right.' Such orders were used in two of the three UK interlocutory cases. 'It would substantially deter infringers if they knew of this,' Simon commented. 'Copyright protection can be effective; it can be quick — you can go to court and get an order within a few hours.'

What happens if your program is pirated? Nick Alexander said: 'When you do nail people, getting decent penalties for a successful prosecution is a problem.' Under the 1956 Copyright Act a fine of £2 per item is imposed or imprisonment not exceeding two months. Simon Elsom believes that in order to be an effective deterrent such penalties need to be brought in line with the recently formulated video piracy penalties (£200 or two years' imprisonment).

These penalties are meted out for the criminal offence of dealing in infringing copies, but it's also possible for a company whose software has been copied to obtain damages under civil law. To be awarded such damages, the company must establish the number of distributed infringing copies which it would have been able to distribute. These are conversion damages and relate to the amount of business the company lost as a result of the infringement.

Cases of counterfeiting can also be pursued by trading standards officers who are empowered to examine pirated goods under the Trade Descriptions Act. Ann Staines says a number of local authorities are keen to pursue software piracy but for some reason software manufacturers are not acting. 'Whether this is because the commercial black market is not a problem to software manufacturers or because they don't realise they have the possibility of getting trading standards officers to take action is not clear.' Under the Act, penalties of £1000 for each offence can be given in a Magistrates Court and unlimited fines in a Crown Court.

In the games market, it's possible for two companies to bring out the same game because unscrupulous games authors have offered a game to several software houses at the same time and negotiated payment from more than one. The Society of Software Authors, which is affiliated to the CTA and holds its inaugural meeting in early May, will recommend to software houses that they don't accept a game unless it has been registered, providing less likelihood of such things happening.

Patents

A limited amount of software can be patented. Computer programs as such cannot be patented as they are on the list of excluded items. However, an invention which includes a computer program may be patentable. A period of two to three years might elapse between filing an application for a patent and being granted the right, making it unsuitable for many programs in the fast changing software industry. Simon Elsom added: 'It's a very powerful right — a monopoly right — and is not given out willy nilly. It is also expensive to obtain.' A patent is granted for a 20 year period.

Since most programs do not qualify as patentable, a more crucial concern for the software industry is to dispel the uncertainty surrounding copyright. Groups such as FAST can publicise the urgent need for reform but it is up to the Government to act. It is time now for ministerial promises to become a reality.

END

STOP PRESS

An important first step toward computer software enjoying legislated copyright protection in the UK was taken as we went to press. During the passage through the Lords of the Cable and Broadcasting Bill, Home Office minister Lord Elton agreed in principle that 'there should be copyright in the broadcasting or the diffusion by cable of computer programs.' The exact detail of the clause, which will presumably include a definition of a computer program, remains to be worked out during the subsequent course of the Bill in the House of Commons. The Bill should receive Royal assent later this year. This will be the first time that copyright of programs has been the subject of UK legislation and will therefore set a useful precedent for software entitlement to copyright protection.

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5. Interfaces: serial printer, external floppy drives, hard disk, data communication, slave monitor, IEEE-488

* CP/M is a trademark of Digital Research Inc

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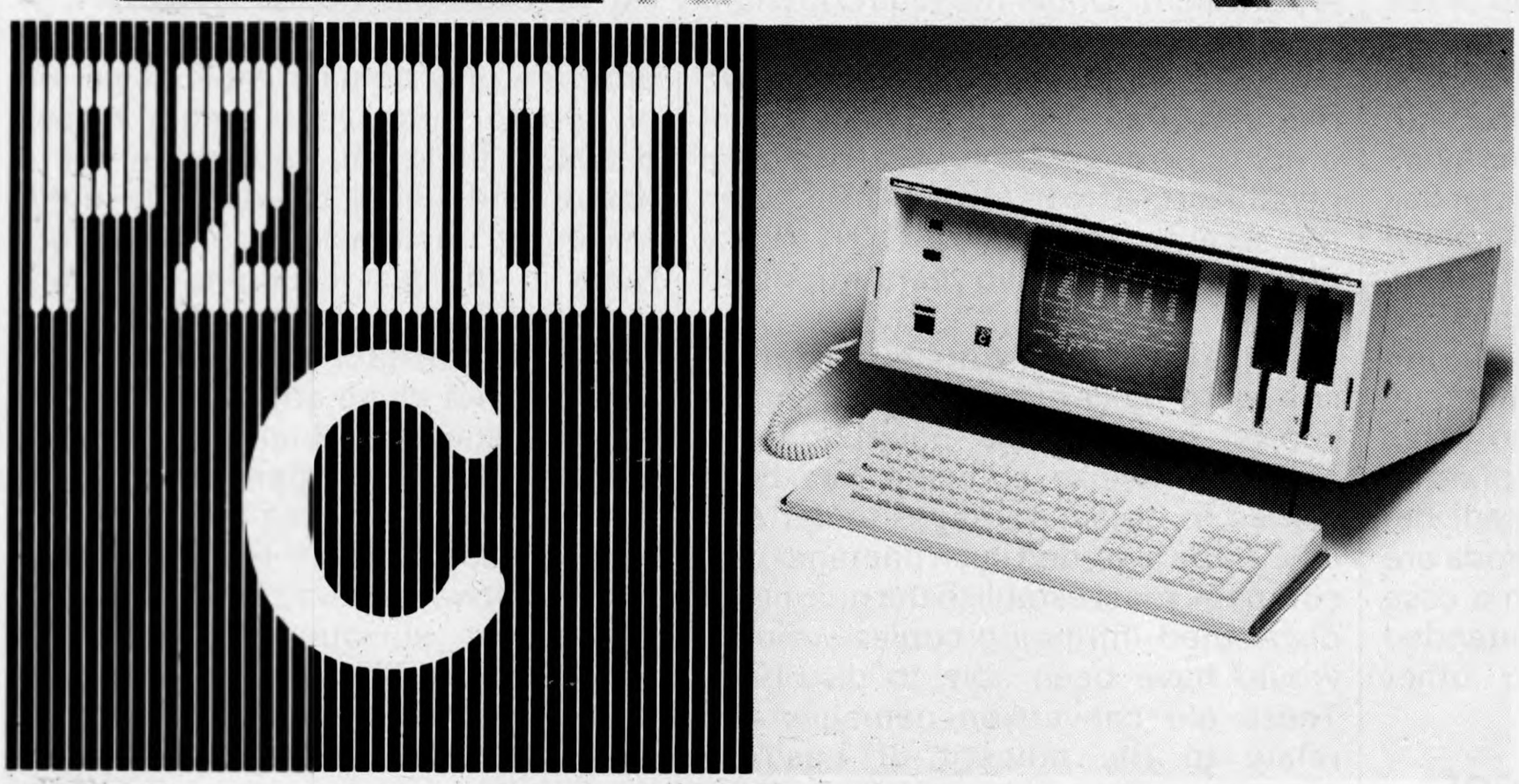

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Basicode

Despite the differences between individual dialects, virtually every machine supports a minimal subset of Basic. Surya concludes his explanation of Basicode with instructions on how to load and run a Basicode program, and details of Basicode-supported machines.

In order to load and run a Basicode program you'll need three things: a computer capable of running Basic, a copy of Basicode-2 and a little patience! At present, Basicode is available for nine machines (see Fig 1) and a version for the Spectrum is expected very soon.

To load a Basicode program, load Basicode-2 and then load the program. To write a Basicode program, load Basicode before writing the program and then save it as normal — it will automatically be saved in Basicode audiocode. Don't forget to mark all Basicode programs as such, as they can't be loaded without Basicode-2.

Basicode programs can be written on any one of the nine machines and loaded and run on any of the other eight, but beware — there's a catch. The subset of Basic supported by all the machines listed is rather small: forty-two statements, in fact (Fig 2).

Protocol

The authors of Basicode tackled this problem by devising a protocol for Basicode programs. Under this protocol, certain functions are assigned to specific line numbers. Line 100, for example, is used to clear the screen. Basicode listings will read 'GOSUB 100' whenever the screen is to be cleared. When you load a Basicode program, insert your machine's clear-screen statement (CLS, or similar) at line 100.

There are, of course, common functions which all the machines are capable of performing, though in different ways (clearing the screen, directing output to a printer, and so on). Basicode-2 takes care of these by automatically inserting these routines at the appropriate line numbers when the Basicode translation program is loaded. These built-in routines are:

100 Clear the screen.

110 Using the variables HO (horizontal) and VE (vertical), place the cursor at a specific screen location. (0,0) is top-left, and Basicode assumes a 24×40 screen.

120 Return the current cursor position in the variables HO and VE.

200 Scan the keyboard for a keypress. If a key was pressed, place the character into the variable IN$, otherwise IN$ is empty. CHR$(13) is universally used for carriage return (meaning that the ENTER or RETURN key was pressed), as is CHR$(32) for the space bar. Other control characters may have different meanings on different machines and should therefore be avoided.

210 As 200, but scan repeatedly until a key has been pressed.

250 Beep!

260 Return a pseudo-random number between 0 and 1 in the variable RV.

270 Force 'garbage collection' and return the number of unused bytes of RAM in the variable FR.

300 Turn the numeric variable SR into the string variable SR$. Note that SR$ does *not* have spaces at either the beginning or end of the string, so the standard Basic STR$ statement is forbidden in Basicode programs, GOSUB 300 being used instead.

310 This is a crude form of PRINT USING statement. The variables SR, CT and CN are passed to the program and the result is placed into SR$. SR is the numeric variable to be formatted, CT is the total length of the string to be returned, CN is the number of characters to be placed after the decimal point.

350 Print SR$ to the printer.

360 Close the printer channel (if necessary).

For example, to print NM$ to the printer, a Basicode author would write '2000 SR$=NM$:GOSUB 350'.

If a Basicode author wants to perform functions not supported by Basicode (for example, flash '*** CRASH!!! ***' in the centre of the screen), he calls a subroutine at an allocated line number and places REMarks at the specified lines, explaining what the subroutine is to do:

```
3000 GOSUB100:GOSUB22000
 - - -
22000 REM Car has crashed.
22001 REM Flash the phrase '***
  CRASH!!! ***'
22002 REM at the centre of the screen
  for 3-4
22003 REM seconds.
22010 RETURN
```

Simplified, there is a recommended format for Basicode:

0-999	Reserved for standard routines.
1000-19999	The main program: Basicode statements, GOSUB calls and remarks *only* to be used within these lines.
20000-24999	Programmer-defined subroutines (like the 'CRASH' example above) must be *clearly* explained by REM statements, and sufficient space left for the user to insert appropriate code.
25000-29999	Lines containing DATA statements.
30000-32767	Lines containing general REM statements, to detail what the program does, instructions for use (if not given elsewhere), program structure, use of variables and so on.

No line number must be higher than 32767, as this is the upper limit of many micros. Lines should also be numbered in steps of ten to allow users to insert extra lines of code when necessary.

There are some machines which support Basicode but do not have a 40×24 screen, so bear this in mind when writing Basicode programs. There are also a number of restrictions regarding the use of variables. These are:

1 Numeric variables are assumed to be single-precision. Since some machines calculate only to six decimal places, your program should not rely on greater accuracy.

2 All variables consist of two characters, the first of which must be alphabetic. Lower case letters must not be used in variable names since some Basicode micros have upper case only. String variables are specified by a dollar sign ($) as in AA$. No other forms of variable types (!,%, and so on) are allowed.

3 You must not use the value of logic variables (as in 'C=(A=2) + (B=3)') in calculations, as some micros equate −1 with true while others use +1.

4 ALL variables *must* be predefined before they are read. Some machines automatically set all variables to zero when a program is run and a statement such as 'TM=TM+1' is perfectly acceptable. On other micros, however, such a statement results in an undefined variable error unless TM has been assigned a value previously. You will need one or more program lines, setting variables to their initial values, even where that value is zero.

5 The maximum string length is 255 characters.

6 The following variables are reserved for communication with standard Basicode subroutines: HO, VE, FR, SR, CN, CT, RV, IN$ and SR$.

7 Finally, the following variables have special meanings on some or all machines and are therefore illegal in

LANGUAGES

Apple II & IIe
BBC
Commodore 64
Electron
Sharp MZ80A
TRS-80
Video Genie
VIC 20
ZX81
Fig 1 Machines supported by Basicode

Basicode: AS, AT, FN, GR, IF, PI, ST, TI, TI$, TO.

You will have realised that writing in Basicode is a disciplined activity; there are plenty of restrictions, not only on what you can do, but also on how and where. That, unfortunately, is the price of a protocol which attemps to be all things to all micros.

Conclusions

Basicode, by its very nature, does not allow flashy graphics and other machine-dependent features: it's a 'no-frills' language. Writing in Basicode requires a disciplined approach, and the ability to explain clearly and in detail the purpose of any non-Basicode routines included.

Running a Basicode routine, too, often involves more than simply loading it and typing RUN. It may be necessary to spend thirty minutes, an hour or even longer writing and inserting the appropriate non-Basicode routines.

But it works! For the first time, we have a standard protocol for home micros which allows Basic programs to be loaded and run on nine popular machines. Among the obvious applications are direct up- and downloading of Basicode programs through bulletin boards and Micronet, via Ham radio transmissions, using modems on a private computer-to-computer basis, or simply by exchanging cassettes with other users.

Basicode is only a partial answer to the thorny problem of standards, but it's a good one. More so, I feel, than the MSX approach, which is to make all machines virtually identical. The former's popularity remains to be seen, but the BBC's 'Chip Shop' broadcasts have sparked off a considerable amount of interest among hobbyists.

Basicode submissions to *PCW* Programs are welcome, but please read all the protocols and restrictions carefully — an 'almost Basicode' program is about as much use as an 'almost MSX' machine!

The next 'Chip Shop' series on Radio 4 begins in September. Basicode kits for the machines listed are available for £3.95 from Basicode-2, Broadcasting Support Services, PO Box 7, London W3 6XJ. Cheques/POs should be made payable to 'Broadcasting Support Services'. There is no need to state your machine as the Basicode-2 cassette has translation programs for each of the nine machines. Basicode kits are distributed on a non-profit basis.

END

ABS	AND	ASC
ATN	CHR$	COS
DATA	DIM	END
EXP	FOR	GOSUB
GOTO	IF	INPUT
INT	LEFT$	LEN
LET	LOG	MID$
NEXT	NOT	ON
OR	PRINT	READ
REM	RESTORE	RETURN
RIGHT$	RUN	SGN
SIN	SQR	STEP
STOP	TAB	TAN
THEN	TO	VAL
*	/	+
–	^	<>
=	<	>
<=	>=	

Fig 2 Basicode statements, functions and operators

LEISURE LINES

by J J Clessa

Quickie

The grooves on long playing records are one thousandth of an inch wide. How many grooves will there be on one side of a 12in LP if there is a lead-in strip 3/16in wide, and a centre run-out section of 4.3in diameter?

If you need pencil and paper, you're on the wrong track.

Prize puzzle

Sales of the XQ48, the latest personal computer from the Reliachip corporation of Australia, were booming. Revenue at the Adelaide branch was 81 dollars and 51 cents short of one million dollars, from XQ48 sales alone.

At the Melbourne branch, the story was even better. Sales of the XQ48 fell short of one and a half million dollars by only 14 dollars and 77 cents.

The Sydney branch manager sold 7000 XQ48's. What was his revenue?

Answers on postcards only please, to: Prize Puzzle May 1984, Leisure Lines, *PCW*, 62 Oxford St, London W1 to reach this office not later than last post of 31 May '84.

Incidentally, only postcard answers (or backs of envelopes) are eligible for the draw. We like to get your letters but not as problem entries, so please stick to the postcards.

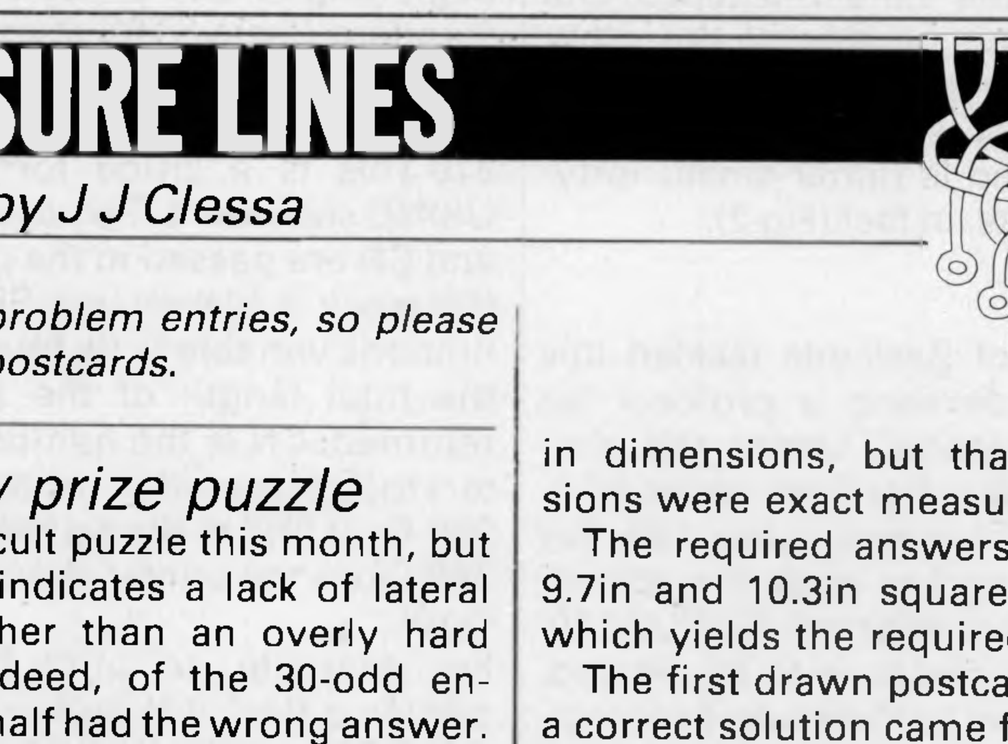
February prize puzzle

Quite a difficult puzzle this month, but it probably indicates a lack of lateral thinking rather than an overly hard problem. Indeed, of the 30-odd entries, about half had the wrong answer. We did not say that each of the paintings was a whole number of feet in dimensions, but that the dimensions were exact measurements.

The required answers were 11.3in, 9.7in and 10.3in square respectively, which yields the required results.

The first drawn postcard containing a correct solution came from a lady — Mrs Hill of Derby. Congratulations, your prize is on its way.

END



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BASIC COMPILER	Digital Research
IS COBOL	Micro Focus
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ORTH	Supersoft
ORTRAN	Supersoft
ORTRAN COMPILER	Microsoft
EVEL-2 COBOL	Micro Focus
ISP	Supersoft
uLISP	Microsoft
uMATH/muSIMP	Microsoft
ASCAL COMPILER	Microsoft
ASCAL MT+	Digital Research
L/1	Digital Research

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QUICKCODE	Fox & Geller
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THE LAST ONE—COMPACT	D.J. 'Al' Systems

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PLANTRAC 1	Computerline
PROFIT PLAN	Chang Labs
QSTAT	Pivotal Software
STATSPACK	MPI
TK! SOLVER	Software Arts
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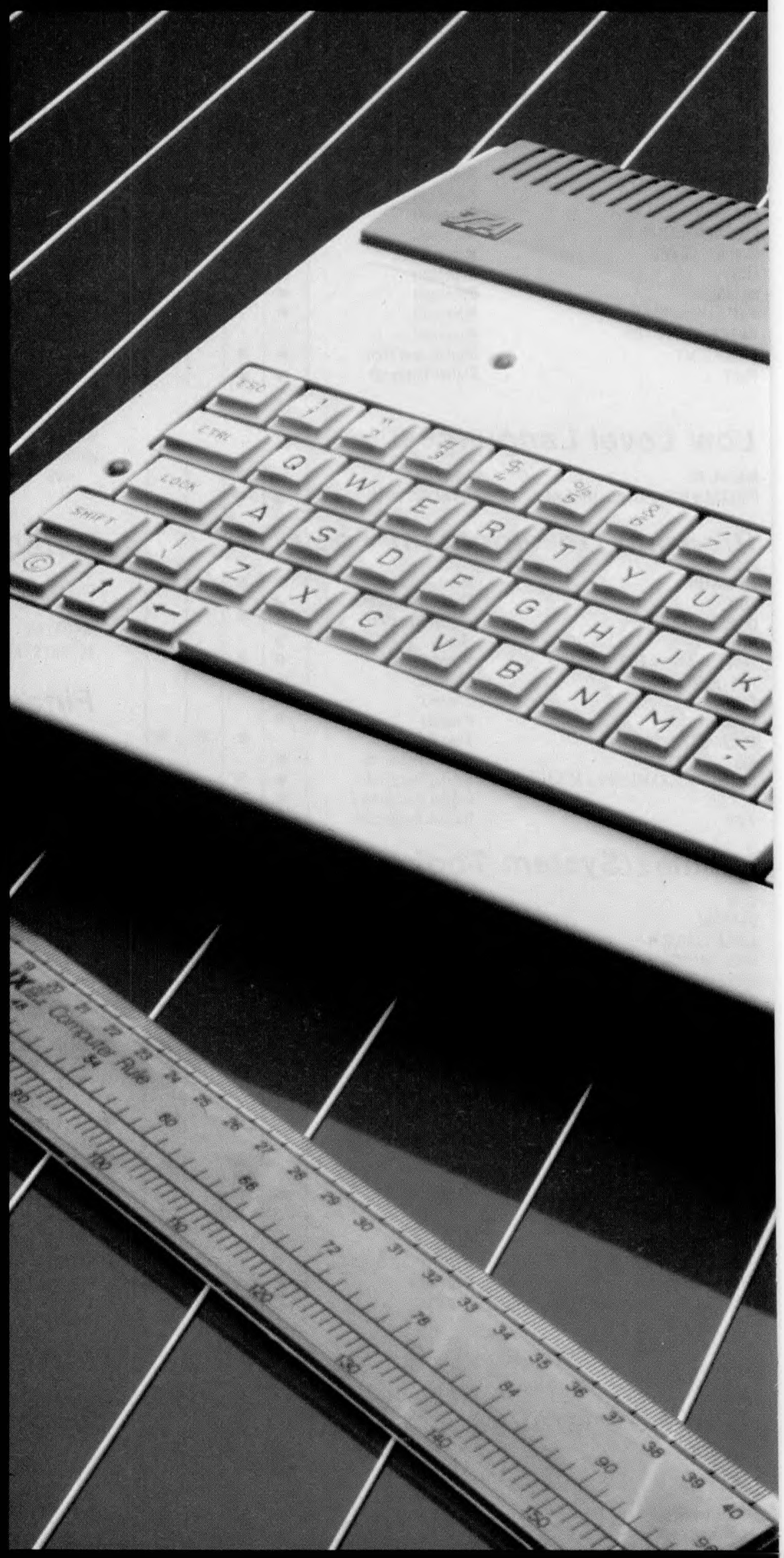
The Alphatronic





The Alphatronic Personal Computer makes playing, learning and working more fun, more fullfilling, more rewarding. But when you put it to work, then it really means business. In fact it's probably the cheapest way to access business programmes through CP/M software.

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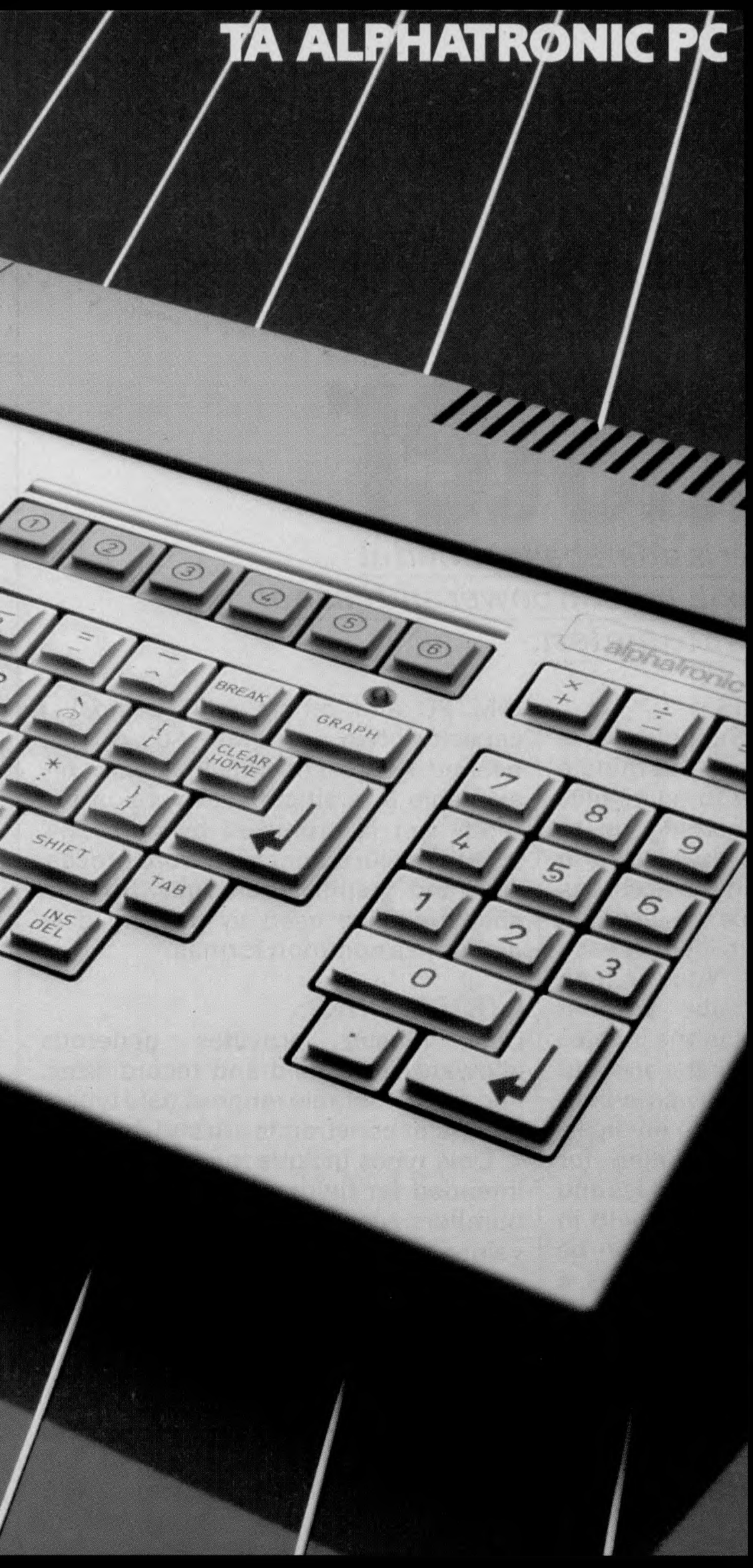
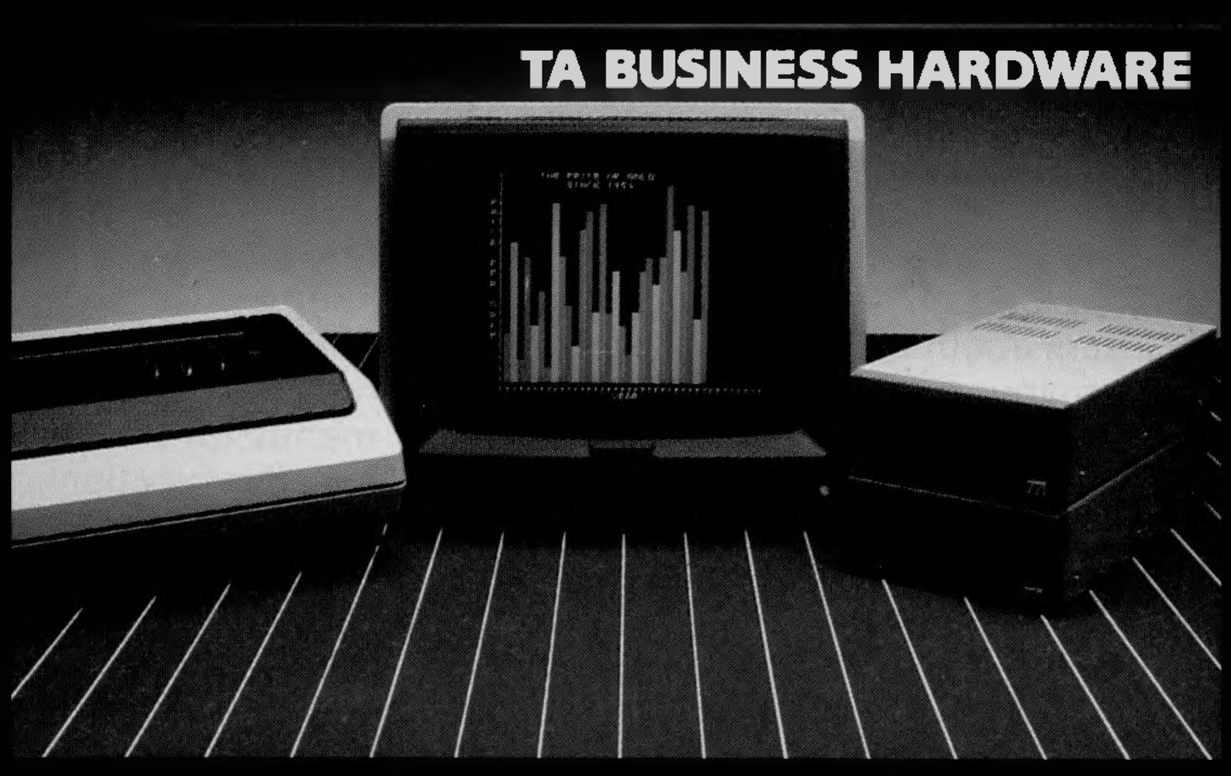
You may recognise the keyboard, because the

: means business









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E5

SOFTWARE

Data Master

Sapphire Systems' Data Master is a database aimed at treading the middle path between flexibility and power and ease of use. Kathy Lang puts it to the test.

Those who are used to working on mainframe computers and who are new to the world of micros are often confused by the micro habit of calling all data management and file management packages 'DBMSs' — database management systems. In fact, very few micro packages come close to providing the kind of features which mainframe users of database management systems take for granted.

The most obvious difference is in being able to relate together sets of information with a dissimilar structure. In accounting applications, for instance, you may need to refer to customers' names and addresses located in several different parts of the filing system — invoicing, standard letters about special offers, and so on. In many data or file management packages, this can only be done by storing the customer's name and address with each invoice in the invoice file, and by keeping a separate record of customers' names and addresses for marketing purposes. In a true DBMS, you only need to store such information once, which not only saves storage space but also makes it more likely that you won't update information in one place and not in another.

Some micro packages allow you to keep two or more files of information available at a time, but without expressly relating the two together — that's the user's responsibility. Increasingly, however, packages are becoming available for micros which take an approach closer to that of true DBMSs. The problem that arises is how to provide this greater flexibility and power without making the package much more difficult to use: most DBMSs on mainframes require a 'database administrator' in charge of the information to shield the users from the complexities of the DBMS.

Data Master, from Sapphire Systems, is an attempt to tread this middle path. It enables the user to relate files together explicitly by naming up to three fields which 'tie up' the records in each file. For instance, in the accounts example you might use an account number and a surname to identify each client, as a double check. You can then tell Data Master that the account number and name fields in the invoice file are to be matched with the account number and surname in the name-and-address file when processing invoices. Data Master provides facilities for 'posting' information between files and for referencing the value of a field in another file; complex systems can be built up on this basis. To help in this, a more experienced user may set up menus for the less expert to carry out specific functions, and users can be limited to just those menus by a password protection system.

Data Master originates in the States where it's marketed under the name Data Ease, which is also available in this country from other suppliers. The main difference is in the manual, which Sapphire, a UK company based in Essex, has had rewritten for the home market. Data Master makes extensive use of special keyboard features such as function keys, so, although it runs under MS-DOS, it is not available on every MS-DOS system. I used it on a Sirius; it's also available on the IBM PC, DEC Rainbow, NCR Decision Mate V, Wang PC and Texas Instruments' Professional, with other systems in the pipeline. A CP/M-86 version is planned for later this year.

The package requires 192k memory (128k for the IBM PC). On the single-sided Sirius you can just squeeze all the program files on one disk, but on the IBM PC and others with a smaller capacity two program disks are needed. At present, Data Master is only available in a single-user version but multi-user is promised by mid-1984, together with companion word processing and graphics packages. Spreadsheets can be used by passing data across in a common format.

Constraints

Data Master provides generous allowances for field and record sizes, and a considerable range of data types: the major constraints are shown in Fig 1. Data types include 'numeric string', intended for fields such as telephone numbers which must contain numeric values but which must not be used in arithmetic, a reference field type which allows you to look up abbreviated codes in a reference list and store the full version, and the ability to derive field values from those in other files. Dates may be stored in any format, but unfortunately there is a bug in the current version of Data Master which means that if dates are stored in DD/MM/YY format they don't sort correctly.

The only unusual limit is on the naming of databases. Each database has a single character name, so you are limited to 26 on one disk. However, this name applies to the whole database including all related files, so it's not an important limit. In most applications you simply go into a single database and work in that for a long period, rather than dotting around between them. You might only have one database in all, containing several files. Each of these are identified by the form used to add and amend records, and these form names may be up to 20 characters long.

Setting up a file to store information involves defining the contents of each

record and the way it's to be displayed on the screen. Forms definition is requested from the main menu, the name of the form is specified and a (nearly) blank screen appears on which the format can be 'painted'. The cursor keys are available to move around and the top line shows the current row and column position of the cursor. To specify a field, type in its name and press the relevant function key (the purpose of each function key is shown at the bottom of the screen). Data Master assumes that the caption you have just typed is to be the name of the field for retrieval purposes (when defining reports for instance), but you can override this if preferred. You must then give the type and length of the field. Other attributes, such as unique value, indexing, mandatory entry, default value, protection from entry, and so on, may be defined or you can accept all the defaults by pressing another function key.

The screen definition for this Checkout, together with the list of fields with their attributes, is shown in Fig 2 — to provide some idea of the variety of definition options available. It is at this stage, too, that you can define any formulae to be used for calculating derived variables and specify any fields to be taken from records in other files.

In addition to ensuring that data entered conforms to the correct type, or is chosen from the list given for reference fields, Data Master can check that field values (whether alphabetic or numeric) fall within a given range. However, there is no way to ensure that they follow a particular pattern, such as two characters followed by three numbers.

Any or all of the fields in the file may be indexed. Indexes relate to one field at a time — you can't set up an index based on one field value within another (though you can define such an ordering for reports). Indexes are kept up-to-date automatically. You can decide at any time to keep extra indexes, and you can also change any other aspect of data storage except the name of a field; you can add or delete fields freely too. Any of these changes just require an altered form definition. Once you have accumulated a number of records you might want to think twice about making such changes, as I found these operations rather slow (see Benchmarks 6 and 10 in Fig 3).

Package	Data Master
Maximum file size	65535 records
Max record size	8000 characters
Max no fields	255
Max field size	255
Max digits	14
Max prime key length	255
Special disk format?	No
File size fixed?	No
Link to ASCII files?	Yes, several formats
Data types	N,C,D,L,T,R,£
Fixed rec structure?	Yes
Fixed record length stored?	Yes
Amend rec structure?	Yes
Link data files?	Yes
No data files open	26
No sort fields	Not stated
No keys	255
Max key length (chars,fields)	255, 1
Unique keys	Optional
Subsidiary indexes kept up-to-date?	Yes
Data validation	Good
Screen formatting	P
Report formatting	P,D,L
Stone calculated data	Input, Batch update
Totals & statistics	Statistics, Totals & Sub-totals
Store selection criteria	Optional
Combing criteria	AND,OR,NOT
>1 criterion/field?	Yes
Wild code selection?	Any field
Browsing methods	String within using ? and *
Interaction methods	Menus, commands Limited tailoring
Reference Manual+	**
Tutorial Guide+	***
Reference Card	None
On-Line Help+	****
Hot-line?	Free

Notes: Screen and Report formatting: P=Paint-a-screen, D=Defaults provided, L=Letter format, +=Rating, maximum five stars

Fig 1 Features and constraints

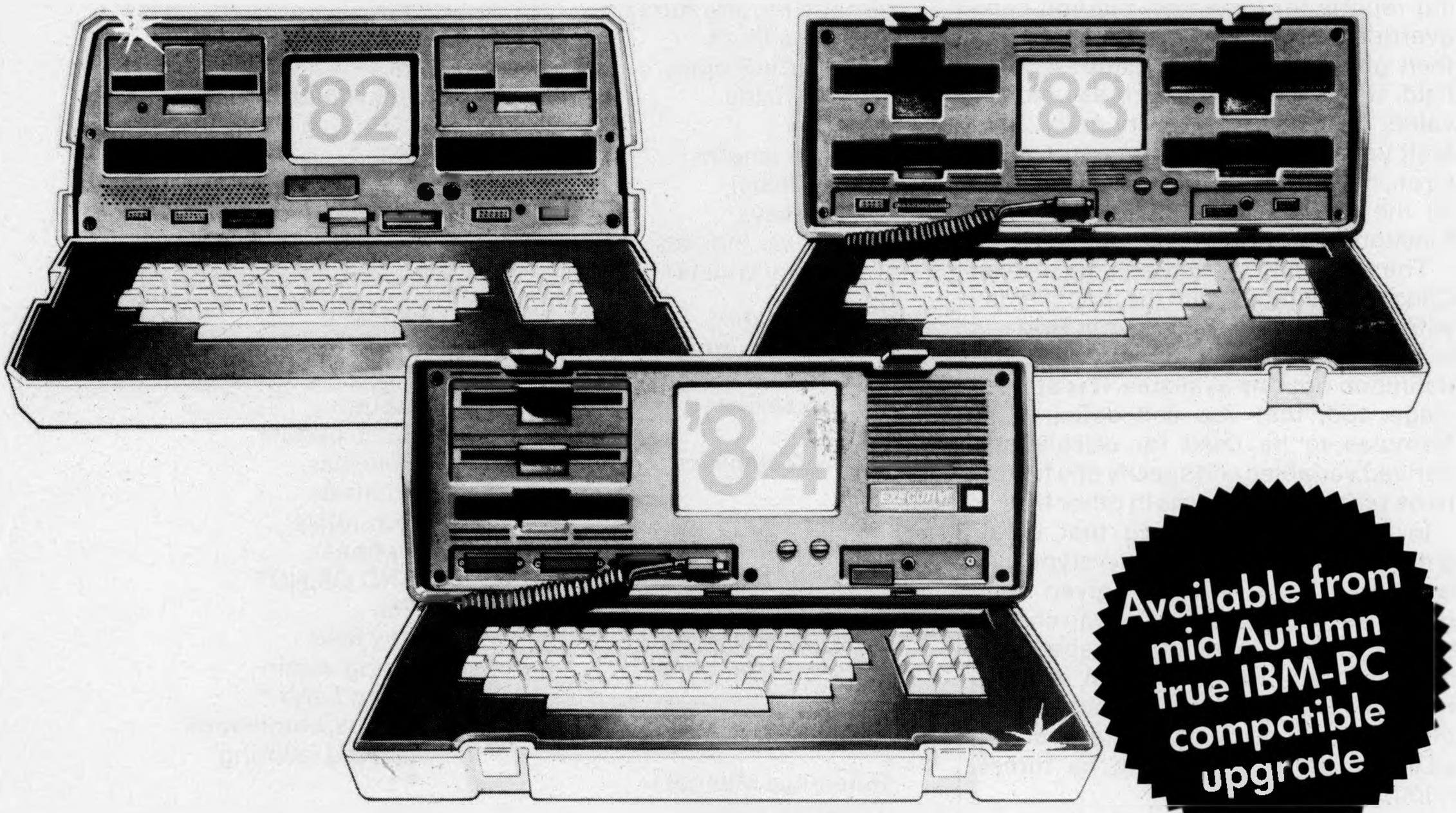
Data input & updating

When entering new records, Data Master displays the set-up form and allows you to enter data as you wish. The cursor keys are available to move around the screen, so if you spot an earlier error you can move to that position and make the alteration. Data Master provides a variety of ways to reach a particular record which needs amendment. You work your way sequentially through the file, either forwards or backwards from your current position, or you can go through the file in the order of any indexed field by moving the cursor to that field, pressing the asterisk key, and then a function key to VIEW the first record in that sequence. To continue in that sequence, press CTRL/VIEW once for each record.

To select groups of records, the required values are entered into one or more fields on the form; two wild codes may be used, '*' for 'match any group of characters' and '?' for 'match any single character'. The test values are 'ANDed' together, so that all tests must be passed for the record to be retrieved. As before, you use the VIEW key to work through your selection. The order in which the records will be presented will depend on whether any of the fields upon which selection was based were index fields. If they were, then the records are presented in order based on the first index field used in the selection. If not, the records are shown in the order they are stored in the file.

Records may also be updated in batches without operator intervention. Such batch updating uses the query language in the same way as reports; a set of records is defined by means of selection criteria and you then have the option to list, amend or delete those records. For amendment, you can set up one or a series of changes involving calculations on fields in the file; for example, to update all prices in a particular product range by 10%. As Data Master allows definition of relationships between files, you can use

THE EVOLUTION OF A REVOLUTION



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these facilities to produce a full transactional system based upon entering a set of records and then 'posting' relevant sections to different files. In this way a complete accounting suite can be built-up, or a variety of other applications in which this kind of interrelation is required.

Records may be displayed either in the one-record-per-screen format used during data entry, in which case the record is available for amendment or, for viewing only, records may be displayed in a variety of formats defined by Data Master's Query Language, using the reporting mechanisms.

Printed reports

Reports may either be 'one-off', so that the format is not stored but is acted upon at once, or stored for subsequent amendment and re-use. In either case, the same approach is used to set up the report format. The package asks what selection and ordering options are required, then which fields are to be processed. All fields can be omitted and summary information only can be produced if required. Selection criteria may optionally be entered when the report is run to allow the same format to be used for a number of different reports. Processing may involve listing records and batch updating can be set up by asking for deletion or modification of records. For this to be possible, you must explicitly set a switch by pressing a function key — to avoid specifying modification by mistake — and you can restrict individual users to an access level which will prevent them setting this switch.

Report fields may involve calculations based upon stored fields and information from several data files. You can use several variables, such as the date and the current page number in report fields. You can also specify that records are to be ordered in groups, with group totals (that is sub-totals) being produced; such groups may be nested without limit. The records don't have to be pre-sorted into such sub-groups — this is done automatically by Data Master at report time.

Once the content of the report has been set up, the layout can be specified. Four types are provided: columnar (one record per line), field-per-line, DIF™ (for writing files which can be read by spreadsheet programs), and free format (in which the user sets up a format using the 'paint-a-screen' techniques used in designing screen forms).

Selection

Different methods of selection are used according to whether you want to display records for amendment on the screen, view them on the screen or amend them 'in a batch' without intervention. When amending, you can specify selection on any field or fields; if more than one field is tested, then all conditions must be met before the record passes the test. Tests available are identity with a constant, or matching with a pattern: for instance, the pattern Smith* matches Smith, Smithson and so on, while *son matches Johnson, Smithson *et al*. During reporting, when records can be viewed on the screen, printed or sent to another file, or amended in a batch, you have more flexible tests available. You can test using the usual range of comparison operators (<, > and so on), and against field values, and tests can be combined so that all must be passed or any one. The extent to which you can force the appropriate order of evaluation of tests depends on the context (brackets are available when testing on single fields).

During display of individual records for amendment, records may be displayed in the order of any indexed field. When reporting, you can sequence on any field or sequence of nested fields (name within department within region within country). Ordering is always in ascending ASCII sequence: there is no way to change this.

Arithmetic calculations can be carried out to provide values for fields at input time, or when records are being amended in batch update. You can also calculate new values for output in reports based on field values and constants. Any of these calculations may combine field values from several

```
1   10   20   30   40   50   60   70   80
+----+----+----+----+----+----+----+----+

Refnum _____ Name _____ Datecre _____
Type         Description

Supp 1 _____ Price 1 _____   Supp 2 _____ Price 2 _____
Supp 3 _____ Price 3 _____   Supp 4 _____ Price 4 _____

Sys 1 _____ Sys 2 _____   Sys 3 _____ Rating _____
Ref 1 _____ Ref 2 _____   Ref 3 _____ Ref 4 _____

1   10   20   30   40   50   60   70   80
+----+----+----+----+----+----+----+----+
```

FIELD DESCRIPTIONS

No	Name	Type	Long	Reqd	Index	Unique	Derived	Range Chk	Record size	Record offset
1	Refnum	Text	5	Yes	Yes	No	No	No	5	5
2	Name	Text	20	No	No	No	No	No	20	10
3	Datecre	Date	8	No	No	No	No	No	6	30
4	Type	Text	3	No	No	No	No	No	3	36
5	Description	Text	40	No	No	No	No	No	40	39
6	Supp 1	Number	6	No	No	No	No	No	4	79
	Number Type :	Integer								
7	Price 1	Number	6	No	No	No	No	No	4	83
	Number Type :	Integer								
8	Supp 2	Number	6	No	No	No	No	No	4	87
	Number Type :	Integer								
9	Price 2	Number	7	No	No	No	No	No	4	91
	Number Type :	Integer								
10	Supp 3	Number	6	No	No	No	No	No	4	95
	Number Type :	Integer								
11	Price 3	Number	7	No	No	No	No	No	4	99
	Number Type :	Integer								
12	Supp 4	Number	6	No	No	No	No	No	4	103
	Number Type :	Integer								
13	Price 4	Number	7	No	No	No	No	No	4	107
	Number Type :	Integer								
14	Sys 1	Text	3	No	No	No	No	No	3	111
15	Sys 2	Text	3	No	No	No	No	No	3	114
16	Sys 3	Text	3	No	No	No	No	No	3	117
17	Rating	Text	2	No	No	No	No	No	2	120
18	Ref 1	Text	6	No	No	No	No	No	6	122
19	Ref 2	Text	6	No	No	No	No	No	6	128
20	Ref 3	Text	6	No	No	No	No	No	6	134
21	Ref 4	Text	6	No	No	No	No	No	6	140

Record size 146

Fig 2 Record definition and format

files and the usual arithmetic operators are provided. There is no substring facility, nor any other method of string manipulation for use in data assignment, as distinct from the testing used in selection.

Relationships between files may be permanent, in which case they are defined in a special file set up by Data Master, or they may be *ad hoc* and last only while a report is produced. The method used is to associate between one and three fields in one file with fields in another.

The system may be tailored at several levels and default values for system options can be set up. The date format and currency symbol will normally be set appropriately by the supplier, while other options, such as the printer type, are set by the user. Once into the system, a special menu can be defined to replace the standard Data Master main menu. User-supplied menus can carry out a single task per item, several tasks, or link to another menu. No conditional statements are available, nor are there any other pseudo-programming language statements, so in some circumstances you may be limited in what you can do.

Security

Data Master allows an unusually flexible approach to security from unauthorised access. Each user may have a user name and password and can have access restricted according to a table stored with the data, so that users are denied access to certain databases. Unfortunately, the protection applies to a whole database rather than to files within it, so you couldn't use this mechanism to restrict users to parts of a database. You can also restrict the level of access allowed so that 'low-level' users may view records, 'medium-level' users may amend them, and only 'high-level' users may set up and amend form and report definitions.

When records are amended or entered, Data Master updates the stored file every time 15 records have been added or amended, or after 30 seconds inactivity, which helps to protect against accidental corruption of the database.

Data Master provides special routines for backing up and restoring its own databases. While these are slower than using good old DCOPY, they do check each record in turn. Within the package, you can also copy a form with or without its data (for instance, to create another data file of similar structure), delete date files, forms and reports, and copy data files, forms and reports between databases.

Data Master's links with outside files are usually flexible; files can be read in several different formats including those of dBasell and DIF, and if appropriate such importing can match on field names or on field order. In contrast with some internal batch processing, importing a file (in dBasell format) of 1000 records is fast by micro standards (see Fig 3). You can also write out data files in a variety of formats, limited only by the flexibility of the report writer.

BM1	Time to add one new record	Inst
BM2	Time to select record by primary key	Inst
BM3	Time to select record by secondary key	Inst
BM4	Time to access 20 records from 1000 sequentially on 3-character field (same field as in BM2 key)	4 sec/rec
BM5	Time to access record using wild code	Inst
BM6	Time to index 1000 records on 3-character field	1hr 12mins
BM7	Time to sort 1000 records on 5-character field	1min 50secs
BM8	Time to calculate on one field per record and store result in record	42mins
BM9	Time to total three fields over 1000 records	1hr 35mins
BM10	Time to add one new field to each of 1000 records	2hr 30mins

Time to import a file of 1000 records: 13mins 50secs

Notes: *=estimated from time for 1000 records

Fig 3 Benchmarks

Data Master uses full screen menus for directing users to the relevant parts of the system and 'mini-menus' after that. Thus, when setting up a form, the screen shows all the fields defined so far in position with the function key assignments at the bottom of the screen, so you know what actions you can take next.

Data Master is somewhat patchy in its willingness to say what it's doing, and to allow you to abandon particular operations (except by pressing CTRL/C and re-entering Data Master, a procedure the manual tells you to avoid because it could corrupt your data).

Documentation

The manual has some weaknesses but is mercifully free from transatlantic idiom. However, it tries to combine reference material with a 'novice' approach, a rarely successful formula.

The material is well written, properly typeset and printed and has many screen diagrams showing what you can expect to see. Unfortunately, the screen highlighting has been represented by a blue wash over the print, which makes it hard to read, especially in the small character size used on screen diagrams. The manual has an index but contains only 60 terms as reference to 180 pages, so it's no surprise that I didn't find it a lot of help.

Conclusions

Data Master is a powerful and flexible package with good features for relating sets of data together, and for interacting with other packages and systems. Its tailoring features are limited by the lack of control over the sequence of processing, and some of the batch operations are rather slow. The package is easy to use with plenty of helpful prompting in most circumstances. It's well worth investigating, particularly by users who want to implement more complex applications; for such users, the availability of a multi-user version could supply a smooth growth path.

END

Summary

Package Type	Database management system allowing multiple relationships among files
Facilities	Flexible screen and report formatting, good data validation including calculations on input and in batch updating. File links include posting transactions. Simple letter writer. Good import/export features including reading and writing DIF™ files from spreadsheets
Drawbacks	Tailoring limited to chaining interactive facilities (no pseudo programming language). Sometimes hard to backtrack. Some batch Benchmarks slow.
Ease of Use	Good; menu-driven with sensible defaults and overrides
Error Messages	Generally adequate
Documentation	Clear and easy to understand, but falls between two stools of tutorial and reference No reference summary
Costs (ex-VAT)	£450
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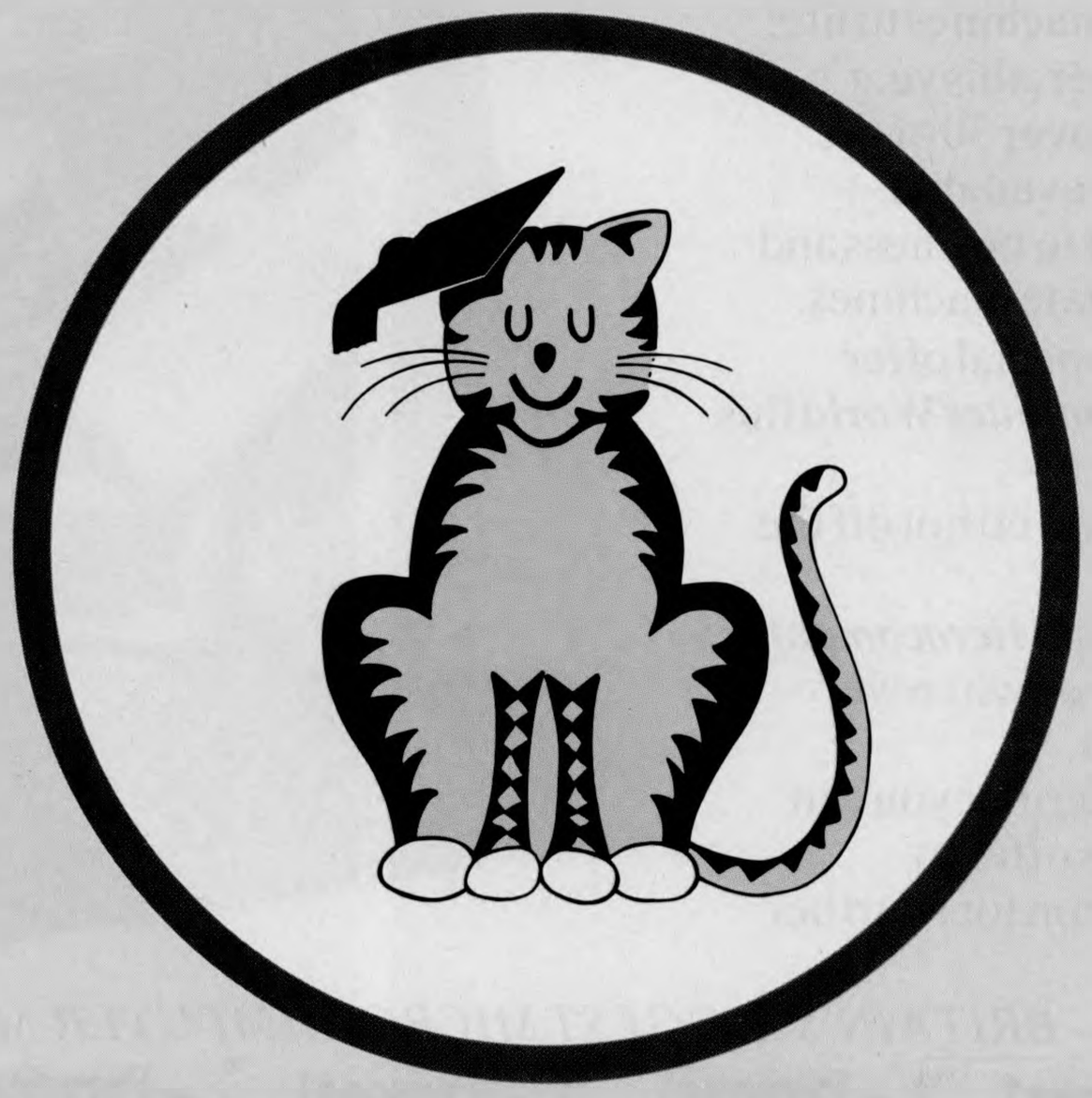

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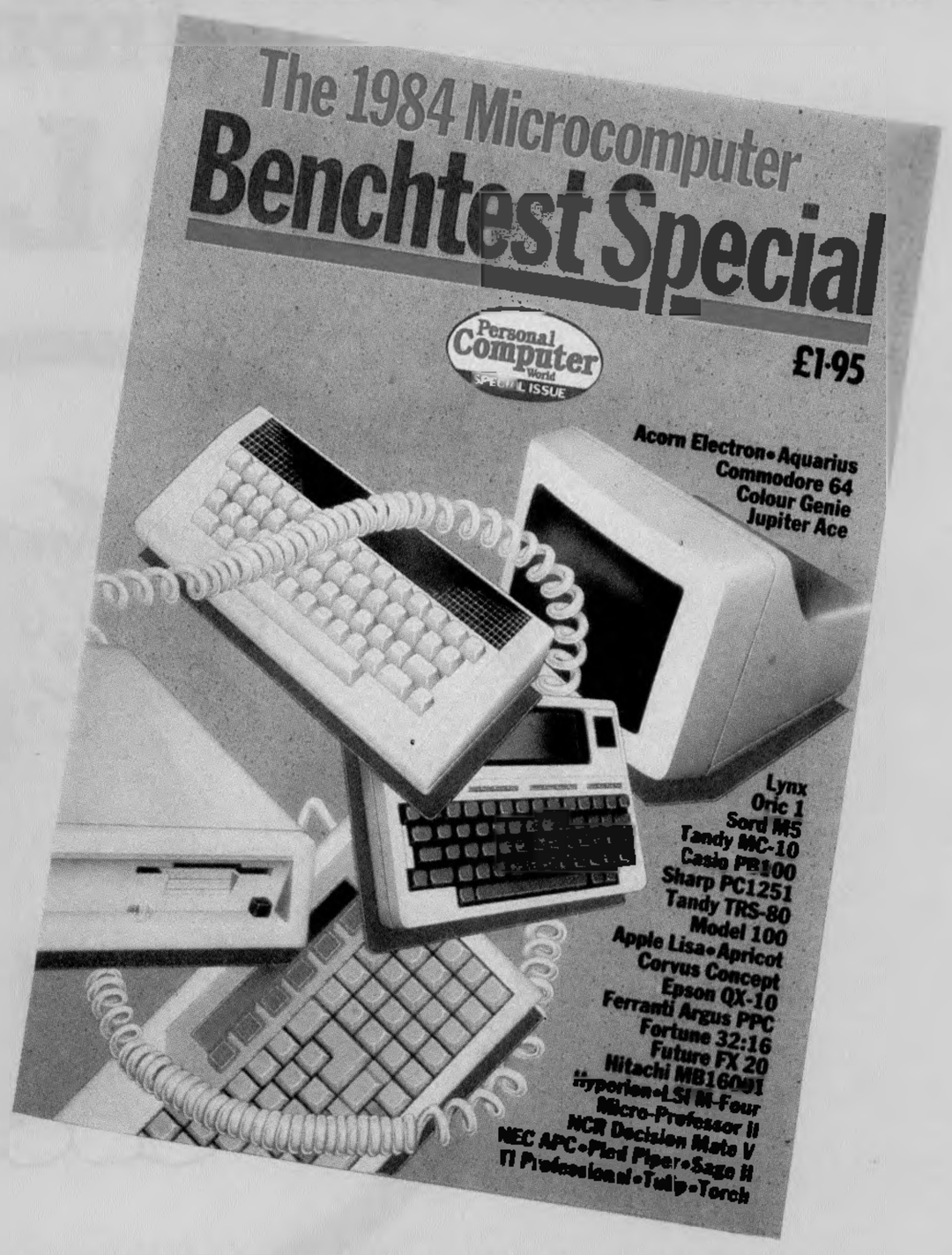

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The baffling jargon of the micro world can be very off-putting at first. Life gets easier once you've been initiated. So here's our user-friendly answer to everything you've ever wanted to know about micro computing but were afraid to ask.

Probably the first thing you noticed on picking up this magazine for the first time was the enormous amount of unintelligible-looking jargon. In the words of *The Hitch-hiker's Guide to the Galaxy:* Don't panic! Baffling as it may sound, the jargon does actually serve a useful purpose. It's a lot easier to say VDU, for example, than 'the screen on which the computer's output is displayed'. This guide is intended to help you find your way around some of the more common 'buzzwords' you're likely to come across in the pages of *PCW*.

For those completely new to computing, let's start with the question: What is a microcomputer? We can think of a micro as: a general-purpose device in contrast to a typewriter, which can only be used for typing; a calculator, for performing calculations; a filing cabinet, for filing information, to name just a few of its functions. A micro can do all these things and more.

If it's to be of any use, a general-purpose device needs some way of knowing what to do. We do this by giving the computer a set of logical instructions called a **program**. The general term for computer programs is **software**. Every other part of a microcomputer system is known as **hardware**: 'If you can touch it, it's hardware.'

Programs must be written in a form the micro can recognise and act on — this is achieved by writing the instructions in a **code** known as a **computer language.** There are literally hundreds of different languages around, the most popular of these being **Basic.** Basic is an acronym of **B**eginners' **A**ll-purpose **S**ymbolic **I**nstruction **C**ode. Although originally intended as a simple introductory language, Basic is now a powerful and widely used language in its own right.

Other languages you're likely to come across in *PCW* are **Forth, Pascal, Logo, C** and **Comal** to name but a few. These are known as **high level** languages because they approach the sophistication of a human language. You'll also see references in *PCW* to the **low level** languages, **assembly language** and **machine code**. We'll look at these in a moment.

The heart of a micro, the workhorse, is the **processor** or **C**entral **P**rocessing **U**nit (**CPU**). The processor usually consists of a single silicon chip. As with computer languages, there are a number of different processors available, the **Z80, 6502, 68000** and **8088** being just a handful (literally!) of the types in common use. The processor is nothing magical — it's just a bunch of electronic circuits. It's definitely not a 'brain'.

As it's electronic, the processor's circuitry can be in one of two states: on or off. We represent these two states by **binary** (base two) notation, the two binary digits (known as **'bits'**) being 0 and 1. It's possible to program computers in binary notation, otherwise known as machine code (or machine language) programming.

Machine code is called a low level language because it operates at a level close to that 'understood' by the processor. Languages like Basic are known as high level languages because they are symbolic, operating at a level easily understood by people but not directly understood by the processor.

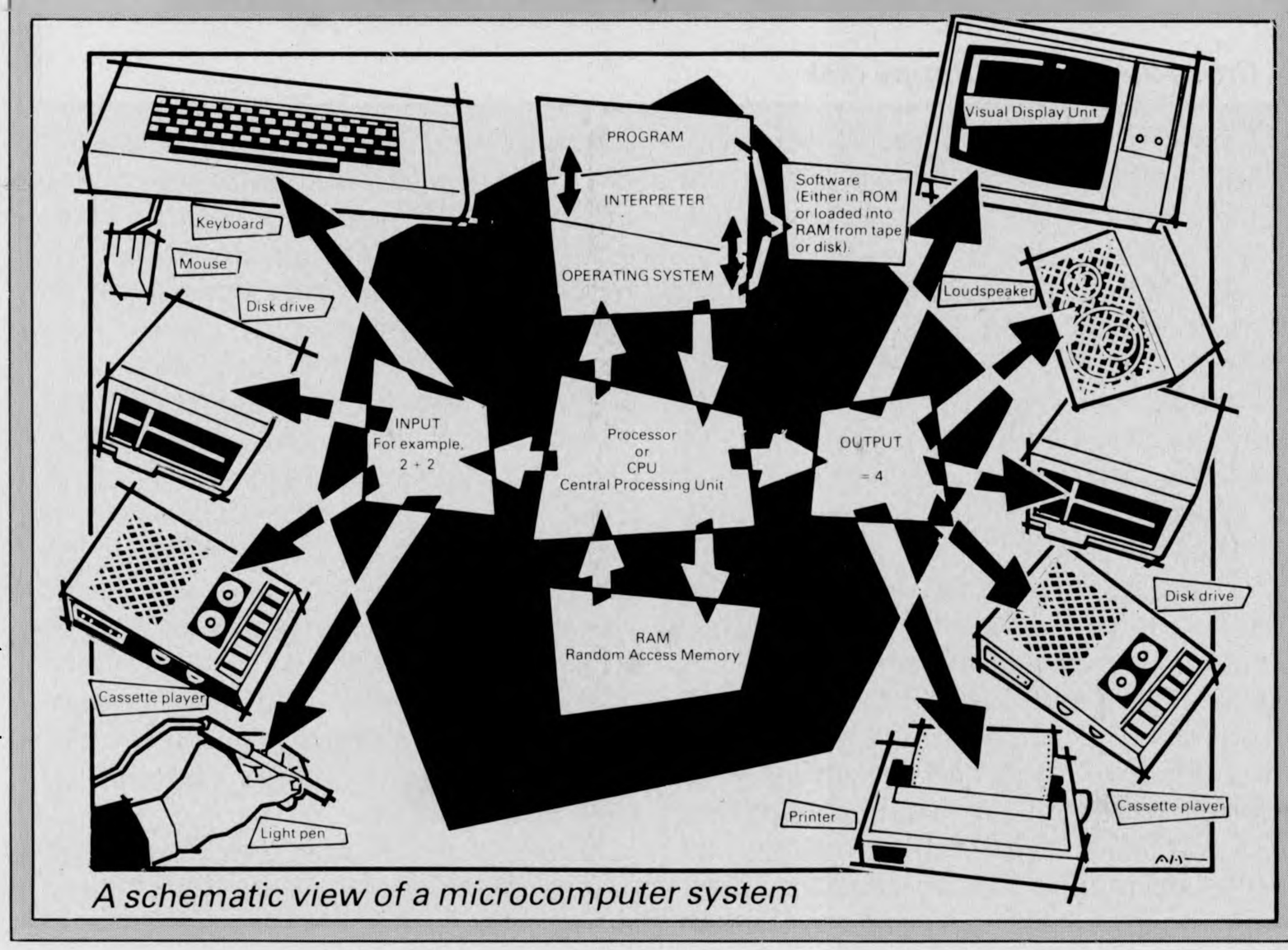
Between high level languages and machine code is a low level language known as assembly language or, colloquially, **assembler.** This is a mnemonic code using symbols which the processor can quickly convert to machine code.

Since everything has to be converted into binary form before the processor can make sense of it, we need some sort of code to represent each character to be processed by the computer. In order to simplify communication between computers, a number of standard codes have been agreed on. The most widely used of these codes is the **A**merican **S**tandard **C**ode for **I**nformation **I**nterchange, **ASCII**. This system assigns each character a decimal number which the processor can then convert to its binary equivalent.

A program written in a high level language must be converted into binary before the processor can carry out its instructions. We could of course do this manually, but since this is exactly the sort of tedious job computers were designed to do for us, it makes much more sense to write a program to do it.

There are two types of program to do this translation for us.

The first of these is a **compiler** which translates our whole program permanently into machine code. When we **compile** a program, the original high level language version is called the **source code** while the compiled copy is called the **object code.** Compiled programs are fast to run but hard to edit. If we want to change a compiled program, we either have to edit it in machine code (extremely difficult) or we have to go back to a copy of the source code. For this reason there is a second translation program: an **interpreter.** An interpreter waits until we actually **run** (use) the program, then translates one line at a time into machine code — leaving the program in its original high level



A schematic view of a microcomputer system

Illustration by Tony Hannaford

language. This makes it slower to run than a compiled program, but easier to edit.

There are two unusual Basic words you're likely to come across: **POKE** and **PEEK**. When you program in a high level language, you are normally unable to choose in which part of the machine's memory the processor will store things. This makes programming easier as you don't need to worry about memory locations, but slows down the program since the processor has to 'look up' addresses for you. Using the POKE command, however, you can 'poke' a value directly into a desired memory address. 'POKE 10000,56', for example, puts the value 56 into memory location 10000. PEEK allows you to examine the content of a particular memory address. If you were to follow the above poke with 'PEEK (10000)', the computer would respond by displaying the value 56. POKEing and PEEKing is normally done to increase program speed, but may also allow us to do things which could not be done through Basic.

So far, we have a processor and a program. Since a computer needs somewhere to store programs and data, it needs some kind of **memory.** There are two types of memory: **Read Only Memory (ROM)** and the badly-named **Random Access Memory (RAM)**. ROM is so-called because the processor can 'read' (get things out of) its contents, but is unable to 'write to' (put things in) it.

ROM is used to store **firmware,** the name given to software permanently available on the machine. An interpreter is a typical example of firmware (stick with it: it gets easier!).

RAM differs from ROM in two important ways. Firstly, you can write to it as well as read from it. This means that the processor can use it to store both the program it is running and **data** (information). The second important difference is that RAM needs a constant power supply to retain its contents: as soon as you switch the computer off, you lose your program and data.

There is a type of RAM, known as **CMOS RAM,** which requires only a tiny amount of power to retain its contents. This is found in portable computers like the Tandy 100 and the Gavilan MC. It is usually powered by small ni-cad batteries so that programs and data are retained even when the main power is switched off. At present, CMOS RAM is extremely expensive and is not likely to be used in desktop machines for a little while yet. (CMOS stands for **C**omplementary **M**etal **O**xide **S**emiconductor).

Memory is described in terms of the number of characters we can store in it. Each character is represented by an 8 bit binary number. 8 bits make one **byte** and 1024 bytes make one **Kilobyte** or **1k**. 32k, for example, means that the computer can store about 32000 characters in its memory. If 1024 sounds like an odd number, remember that everything is based on the binary system, thus 1,2,4,8,16 . . . 1024 being the nearest binary multiple to 1000.

While we're on the subject of bits, you'll often see computers and their processors described in terms of their **bit power: 8-bit, 16-bit, 32:16-bit** and so on. This is a means of describing how large a binary number the processor can handle in one chunk. A binary number, incidentally, is known — confusingly — as a **word**. An 8-bit processor, for example, can handle 8-bit words, that is, up to 11111111 (255 in decimal). Anything larger than this has to be broken down into manageable chunks before it can be processed.

A 16-bit machine can handle bigger chunks of data at a time. This means it can handle ('**address**') larger amounts of memory at one time. This is why most 8-bit machines have a maximum of 64k RAM while 16-bit micros usually have 128k upwards.

As 16-bit processors can handle larger words than an 8-bit machine, they ought to be twice as fast. In practice, however, there is a little more to it than that. While it may take a 16-bit machine half as long to work out that 2+2=4, the actual processing is only part of the story.

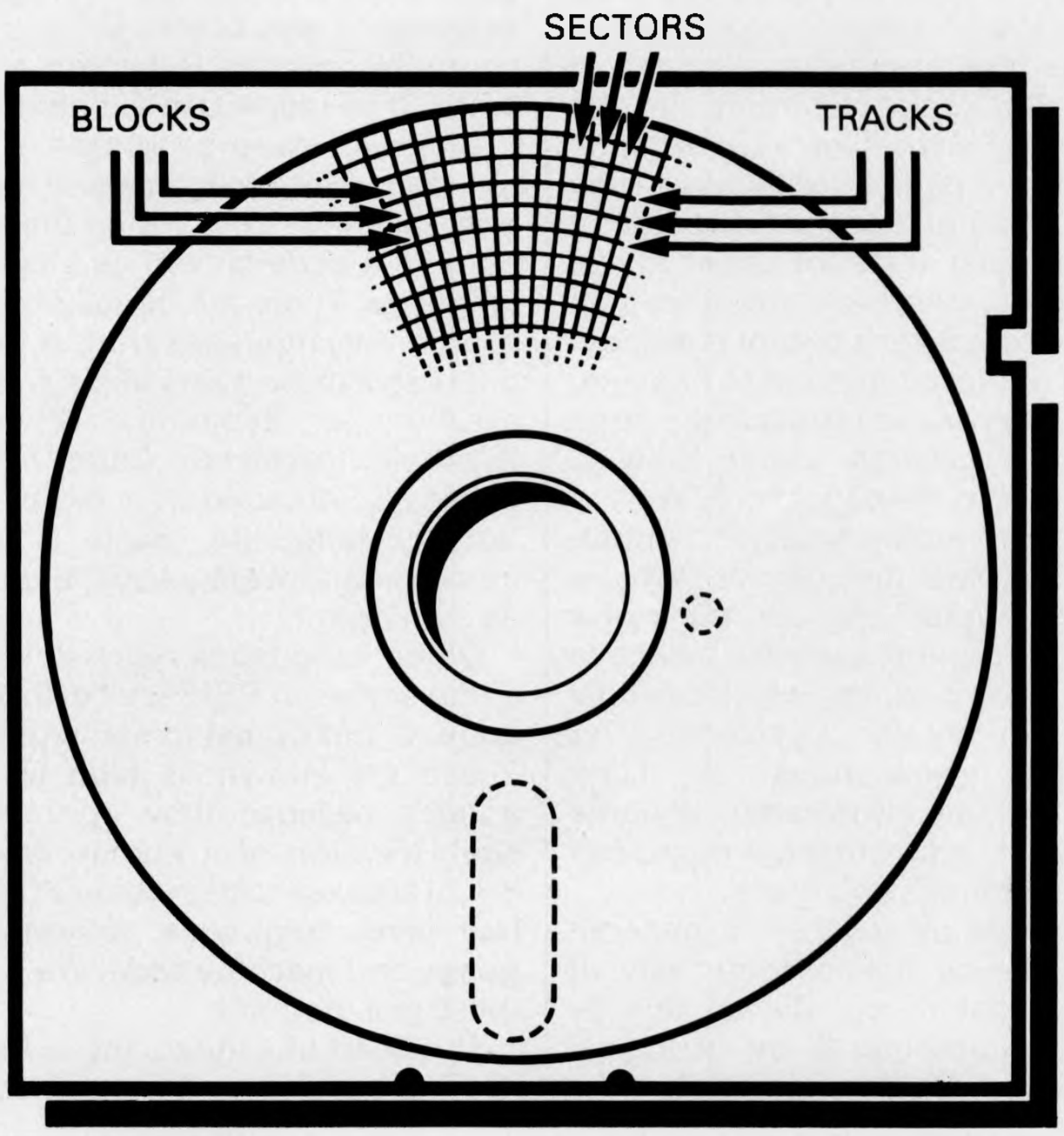
The result of the calculation has to be placed into the appropriate memory location, passed to the screen or whatever is required. The transfers to and from the processor are often made in 8-bit form; this is why you'll hear people arguing that certain processors are not 'true' 16-bit. If the problem has to be handed to the processor in 8-bit form, turned into 16-bit, calculated and then the result turned back into 8-bit for transfer elsewhere, there may be little or no saving in time over an 8-bit system.

The other factor affecting speed is that the actual processing may form only a small part of the overall operation. A word processor, for example, spends most of its time passing files to and from disk and waiting for the user to type the next character. The processing itself consumes very little time. And if you look at the Benchmarks summary (*PCW*, December 1983, pp. 238-241), you'll see some 8-bit machines beating their 16-bit rivals — even in processor-bound operations like the *PCW* Benchmarks.

Returning to the subject of RAM for a moment, a word of warning: Don't rush out with your new-found understanding to buy the machine offering you the most RAM for your money. Quite aside from the fact that the amount of RAM is by no means the only consideration when buying a micro (no matter how much manufacturers may stress it), different machines use differing amounts of RAM for things like graphics. Always check how much RAM is actually available to the user for program storage. Machines which proudly proclaim '64k' may well leave you with less than half of this in which to store Basic programs and data.

There are numerous forms of **permanent** or **back up storage**, but by far the most common are **floppy disk, floppy tape** and **cassette.**

Floppy disks or diskettes are circular pieces of thin plastic coated with a



Cross-section of a floppy disk

magnetic recording surface similar to that of tapes. The disk, which is enclosed in a protective card cover, is placed in a **disk drive**. Disk drives comprise a high-speed motor to rotate the disk and a **read/write head** to record and 'play back' programs and data.

The disk is divided into concentric rings called **tracks** (similar to the tracks on an LP) which are in turn divided into small **blocks** by spoke-like divisions called **sectors**.

There are two methods for dividing the disk into sectors. One method is called **hard sectoring**, where holes punched in the disk mark the sectors, and the other is **soft sectoring** where the sectors are marked magnetically. The reason that disks from one machine can't be read by a different make is that each manufacturer has its own way of dividing up the disk. Recently, however, manufacturers have apparently begun to acknowledge that this situation can't go on forever, and they are working on making their disks compatible.

Since the computer needs some way of organising the disk, we have a program called a **Disk Operating System (DOS)**, usually known simply as the **Operating System (OS)**. The operating system does all the 'housekeeping' of the disks, working out where to put things, letting the user know what is on the disk, copying from one disk to another and so on. As you might expect by now, there are lots of different operating systems available, each with its own advantages and disadvantages. The three most popular OSs are **CP/M** (**C**ontrol **P**rogram for **M**icros), **MS-DOS** (**M**icro**S**oft **D**isk **O**perating **S**ystem) and **PC-DOS** (**P**ersonal **C**omputer **D**isk **O**perating **S**ystem). MS-DOS and PC-DOS, incidentally, are all but identical.

Disks can support what are known as **random access files**. That is, you can randomly choose a point in a file and the drive head will move directly to that point. You can then edit the file, and only the blocks affected will be rewritten. The rest of the file remains unchanged.

Floppy disks provide a reasonably fast and efficient form of secondary storage and are cost-effective for business machines. For home computers, however, the usual form of program and data storage is on ordinary cassette tape using a standard cassette recorder. This method of storage is slow and unreliable, but is very cheap and adequate for games, for example.

Cassettes can support only **serial access files**. That is, whenever a file is to be edited, the whole file must be written back to the tape. This makes certain applications — word processing being a prime example — extremely tedious.

Floppy tape drives are a compromise between speed and cost. They use a small continuous loop tape which, like a disk, is divided into blocks. Floppy tape drives rely on serial access files, but by rotating the tape at high speed and using the block markers, they can simulate random access files. The Sinclair Microdrive is a floppy tape drive.

Another type of disk you'll see referred to is the **hard disk**. This is an extremely efficient method of storing large amounts of data. Hard disk capacity generally starts at around 10**Mbytes** (10 million bytes) and rises to . . . well, you name it. Besides offering a much greater capacity than floppies, hard disks are more reliable and considerably faster. They are, however, much more expensive than floppy drives.

Since computers need some way of communicating with the outside world, we need **input** and **output** devices. Input and output devices include all manner of things from hard disk units to light pens, but the minimum requirement for most applications is a typewriter-style **keyboard** for input and a TV-like **Visual Display Unit** for output. The Visual Display Unit is variously referred to as a **VDU, Cathode Ray Tube (CRT)** and **monitor**.

The various component parts of a computer system (processor, keyboard, VDU, disk drives, and so on, may all be built into a single unit or they may be separate, connected by cables.

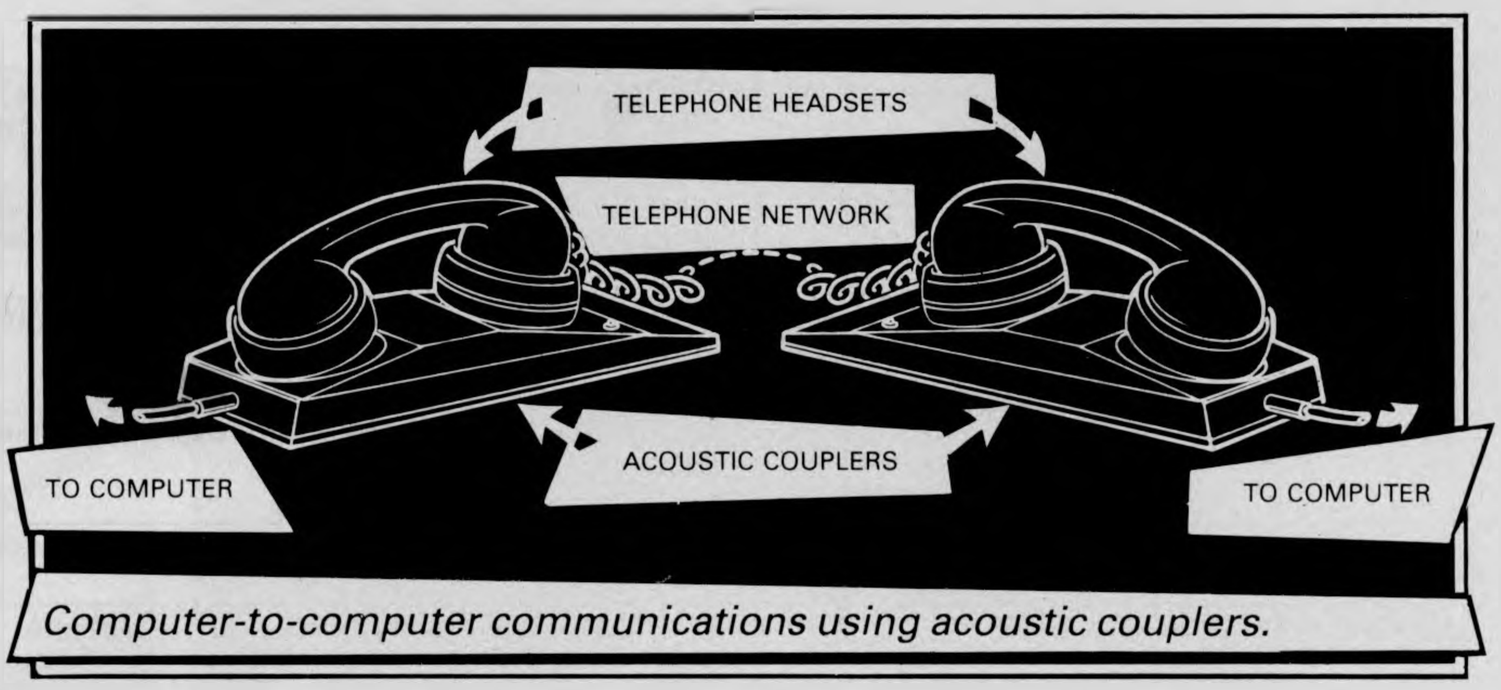
Take this paragraph slowly and it will make sense! When a computer communicates with an outside device, be it a printer or another computer, it does so in one of two forms — **parallel** or **serial**. Parallel **input/output (I/O)** requires a number of parallel wires. Each wire carries one bit, so with eight wires we can transmit/receive information one byte at a time (8 bits = one byte, remember). Serial 1/0, in contrast, uses a single wire to transmit a series of bits one at a time (that's why it's called serial), with extra bits to mark the beginning and end of each byte.

To enable different devices to communicate with each other in this way, standards have been agreed for different **interfaces**. An interface is simply a piece of circuitry used to connect two or more devices. The most common stardard serial interface is the **RS232** (or **V24**) while the Centronics standard is popular for parallel interfaces.

When two computers want to communicate with each other over a distance, there are again two ways of doing it (nothing is ever clear-cut in the world of micros — you'll get used to it). Both methods use the public phone network. The first is known as an **acoustic coupler**. This simply plugs into your computer, and has a receptacle into which you place your telephone handset. The acoustic coupler is convenient in that you can unplug it from one computer and plug it into another one in a matter of seconds. They are generally slow, however, and prone to interference.

The alternative method is to use a **modem**. Unlike an acoustic coupler, a modem is wired into the telephone system and you should get permission for this from British Telecom.

A term you'll hear used in connection with acoustic couplers and modems is **baud rate**. The baud rate is a measure of the speed at which a device can transmit and receive data. You can safely think of the baud rate as being bits-per-second, though the accurate definition is a little more complex. Therefore, a 300-baud modem can transmit/receive data at the rate of 300 bits (about 50 characters) per second.



Computer-to-computer communications using acoustic couplers.

A 1200/75 modem means that it receives at 1200 baud but transmits at 75. Most modems are 1200/75 and acoustic couplers 300/300. By way of comparison, saving programs to cassette is normally done at between 300 and 1500 baud.

Finally, communications between computers is either **full** or **half duplex**. Full duplex is when the machine receiving the data echoes it back to the machine transmitting it and says 'This is what I think you said — is that right?'. If it's wrong, the section will be transmitted again. Half duplex is where no checking is made. If you're ever unsure of which to use, start with full duplex. If everything you type appears on your display twice, then you should switch to half duplex.

Now that you know the jargon, you'll excuse me while I go and initiate a file transfer from secondary memory to RAM in order to engage in some real time interactive processing with 32k 8-bit micro, using a direct entry input device and cathode-based visual feedback system. I never could resist a game of Pacman.

END

IN STORE

Our bi-monthly guide to microcomputing systems. Updates should be sent to: Tracy Dear, PCW, 62 Oxford Street, London W1A 2HG.

Machine & Price	Main Distributor	Hardware	Software	Miscellaneous
Altos 580-20 £5560	Logitek 01-723 0012/3	192k, Z80A, 5¼" FD drive (1Mb), 4xs/p, p/p, 5¼" HD (20Mb)	MP/M11 O/S	1-3 users
Altos ACS8000-14 £9450	As above	208k RAM, Z80A, 8" FD drive (1/2Mb) 6xs/p, pp, 8" HD (40Mb)	MP/M11 O/S	1-4 users
Altos 58640 £10150	As above	512k RAM, 8086, FD 5¼" (1Mb), 6xs/p 5¼" HD (42Mb)	MP/M11 O/S	1-5 users
Altos ACS86000-14 £13750	As above	512k RAM, 8086, 8" FD drive (1/2Mb), 8" HD (40Mb), 8xs/p, p/p	MP/M11 O/S	1-8 users
Apple IIe £1199	Apple (UK) Ltd 44442 60244	6502A, 65-12k RAM, 16k ROM, 24 x 80/40, C int, up to 8,143k (DiskII)	C/S-Dos 3.3, UCSD Pascal CP/M, Applesoft Basic & others	8" FD & HD from other manufacturers. Ask Apple dealer about purchase of Apple II s/w.
Apple III £2395-£3495	As above	Based on 6502B, 256k RAM, 24 x 80, Built-in 143k	O/S-SOS, DOS (emulation) Bus Basic Pascal, etc	Up to 3 add on disk IIIs available.
BBC Micro (£299 inc VAT)	BBC Micro Systems 0933 79300	16-32k RAM: 32k ROM 6502: C int: TV int: RS423 port: P/P: Option: single 5¼" F/D (100k) £230	MOS: Basic A: Pascal Logo: Forth: Lisp	Video text & second processor int. 32k model with Econet and disk interface £399. BT 1/82 (I)
BCL 3050	Business Comp's Ltd. 01-207 3344	64k RAM, Z80A, 8" FD (2Mb), RS232	CBasicII, Basic 80 & others	Facility to use CP/M based s/w & h/w compatible with larger BCL systems. 3150 upgraded model.
BCL 3300	As above	256-960 RAM, 8086, 14" disk drive	Basic, Cobol, Pascal, ALL	CP/M based s/w & BCL, expanded to support 16 terminals in multi-user & multi-tasking.
C3000 Series £2450	Country Comp's 0527 29826	64k RAM, Z80, HD (10Mb), FD (500k), 2 x RS232 c/p	CP/M 2.2	Various H/D options multi-user c/p/NET
CANON AS100 £2290	Canon UK 01-680 8880	128-512k RAM, 8088, 5"/8" disk combinations. (1.2Mb-85Mb) HD, Networking	Many languages & s/w	With dual 8" F/D, Multi-processor systems up to 16 users. HD 7-50 Mg.
Clenio Ace from £2425	Clenio Computing Systems 01-670 4202	64k RAM, Z80A, dual 5¼" ds dd FD (720k per drive), 2xs/p, 2xp/p, inc in price CP/M 2.2	CP/M Plus, Turbodos, DPC, Fortran, Pascal, Cobol, Multiuser	dual 8" FD available, Multiprocessor systems up to 16 users HD 7-50Mb.
Comart Communicator £1595	Comart 0480 215 005	64k RAM, Z80A, dual 5¼" FD (Z80k), 2xs/p, p/p	CP/M included + other O/S, Basic, Cobol, Fortran, Pascal	With 15Mb FD £1895 or 4.8Mb HD and 790k FD £2995. Option 20Mb HD £3995. Other options.
Commodore CBM RANGE £495-£795	Commodore Info Centre 0753 79292	6502, C int, 32-96k RAM, p/p, dual 5¼" FD (2.1Mb) available among other options.	Basic + other languages	Field service available.
Commodore SP9000 £795	As above	As CBM plus 6809, RS232C, Options as above	Various languages	Cobol, Fortran & Pascal are interpreters for use in teaching programming.
Commodore 700 £650-£1195	As above	128-256k RAM, 6509, 25 x 80, RS232	Commodore DOS + others	700 requires separate monitor, 8088 second option.
Commodore 64 £229	As above	64k RAM, 6510, C int, TV, 25 x 40, s/p, p/p, Options include single 5¼" FD (170k)	As above	Option 1701 monitor. Prestel modem option.
Commodore VIC 20 £150	As above	5-32k RAM, 6502, C int, TV, 22 x 23, s/p, p/p, Options as Commodore 64	Commodore DOS, Basic, Kernal	Option 1701 monitor, Starter pack includes 1530 cassette unit.
Country Computers from £2450	Gecas 01-639 3758	64k RAM, Z80A, (10/15/21Mb), RS232	CP/M, Cobol, Basic, Pascal, Fortran	Expandable to Multi-user + Multi-tasking.
Digital DMS3 £3000	Digital Microsystems 0734 793131	64k RAM, Z80A, single 8" FD (100Mb), 3xRS232 p/p, 1xRS422	CP/M + others, Fortran, Pascal PL/1	Expandable to 23Mb or 46Mb to Multi-user HiNet system with HD. Much s/w available.
Digital DMS3/102 £7000	As above	64k RAM, Z80A, single 8" FD (500k), HD (23Mb), 3 x RS232, p/p, 1 x RS422	CP/M + other OS, Cobol, PL/1 Fortran, Pascal	Up to 31 workstations on HiNet, 1280k.
DMS 3F FOX	As above	Z80A, 80k, 2 x 5¼" ds dd disk drives (640k), 80 x 25, 4 x RS232C	CP/M 2.2 (or current version) Basic + other languages	
Epson HX20 £402	Epson 01-902 8892	16-32k RAM, 32k ROM, Twin 6301, 20 x 4 LCD RS232	E Basic	Barcode facility. Communications capability as option.
Epson QX10 £1735	Epson 01-902 8892	192-256k RAM, Z80A, dd FD 5¼" (320k per disk), p/p, RS232, 80 x 25	CP/M, many languages	5 light pen option slots.
Gemini Galaxy 2	Micro Value 024 0328321	64k RAM, Z80A, dual 5¼" FD (800k), 25 x 80, RS232, p/p, C int	CP/M, Basic, Cobol + others	Dual 8" FD (2.4Mb). Galaxy 3 £2500 5.4Mb HD + one 800k FD.
Gemini Galaxy 4 (Network) File server £2600 workstation £695	As above	Same as Galaxy 3 with optional centronics printer I/O, 64k RAM, Z80A, 80 x 25, RS232		Galaxy systems can be upgraded to network superstations.
Gemini Multiboard £500	As above	64k RAM, Z80A, 8 x 25, 5¼" Hard FD, additional memory + I/O, Centronics I/O	CP/M, Basic, Cobol, Pascal, Fortran, AP/L	Modular BUS base system 20 + expandable cards available.
Genie I £287-£381	Lowe 0639 4995	Z80A, 16-48k RAM, up to 4 FD drives, single or dd	Microsoft Basic + other languages available	Optional items available. Contact Lowe for details of Genie II.
Genie III £1950	As above	Z80A, 64k RAM, up to 12k ROM, dual 5¼" double sided dd (730k each), p/p, RS232	New DOS, CP/M, Microsoft Basic, other languages available	Add on and optional drives available.

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	s/w	Software
BT	Benchtested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	p/p	Parallel port	U	Utility

IN STORE

Machine & Price	Main Distributor	Hardware	Software	Miscellaneous
Colour Genie £195	As above	Z80, 16k RAM, 40 x 24, RS232, 2 x p/p	Microsoft Basic	TV or monitor, 16 colours at one time.
Gimix 6809 £3250-£4310	Windrush 0692 405189	56k RAM, Twin serial, 2MHz, 6809 cpu	Much s/w	Designed as a development for industrial control 19Mb HD.
Grundy 8200	M-Tec Comp Service 0603 070620	Z80A, 64k-256k RAM, 24 x 80, HD (6-18Mb), FD ds dd (0.5Mb per disk)	CP/M, Basic and others	Various HD options up to 26Mb.
Haywood 9000 Composite £1795	Haywood 01-428 0111	64-192k RAM, Z80A, dual 5¼" FD (640k) RS232, p/p, 24 x 80	CP/M, Basic, Cobol, Fortran, Pascal, W/P	Expandable to 20Mb HD, networking version planned, other expansion options.
Kemitron 2000E £2300	Kemitron 0244 21817	64k RAM, Z80A, single 5¼" FD (150k), 24 x 80 2 x s/p, p/p	CP/M, Basic, Fortran, Pascal, Cobol, A	Extensive range of support cards & industrial interfaces.
Kemitron K3000E £3300	As above	64k RAM, Z80A, dual 8" FD (2Mb), 2 x s/p, p/p	As above with MP/M	Up to four screens and 4 printers can be attached: Option: 10 Mb HD.
Krypton series from £1695	Transtec 01-247 1327	64-256k RAM, Z80A, 2 x RS232, p/p, dual FD (400/800k) or HD(5/10Mb) + one 400/800 FD	Many languages	
Lynx £225-£445	Computers Ltd 0223 315063	48-192k RAM, Z80A, 24 x 40/80, TV, C int, s/p	Basic, Forth, CP/M	CP/M compatible, 5¼" FD & printer peripherals available.
Minstrel £1790	Hotel Microsystems 01-328 8737	5100 Bus, Z80 8086 or 68000, up to 1Mb RAM	CP/M, MS-DOS, Unix	Networking also available.
Monroe EC8800 £2200	Fi-Cord Int 061 445 7716	128k RAM, Z80A, single 5¼" FD (320k), 3 x RS232, p/p	Monroe multi-tasking O/S, CP/M, Basic, & others	Hi-res colour graphics option: single 5¼" FD (320k), graphics tablet.
Monroe OC8828 £3350	As above	256k RAM, Z80A, dual 5¼" FD (640k), 24 x 80 2 x RS232	As above & system builder	5-20Mb HD
Multi-Computers from £4750	Gecas 01-629 3758/2057	64k RAM, Z80A, 10-600Mb + 8" FD, RS232	N/Star, CP/M, Cobol Basic/Pascal, Fortran	True Multi-user, multi-tasking building block concept system.
Olivetti M20 £1795	Olivetti 01-785 6666	128k-512k RAM, Z8001, 2-8k ROM, single 5¼" FD (160k), RS232, p/p	Basic, PCOS, A & others	Alternative 8086, HD int/ext 370k/640k disks, colour display.
Onyx C8000 £5558	Onyx Comp Ltd 09066 5432	64k RAM, Z80k, 12Mb cartridge, 10Mb HD, 4 x s/p, p/p, 1024k RAM, Z8000	CP/M, MP/M, Oasis, Unix, Fortran, Pascal, W/P, System III	C8001 with 128k RAM, Multi-user version using Oasis are options.
Oric 1 £100-£130	Oric Products Int 0990 27641	16-48k RAM, 6502A, 28 x 40 TV int, C int, s/p, p/p, loudspeaker	Basic (16k ROM) Forth	240 x 200 colour graphics. Micro disk & modem available soon. Viewdata compatible.
Panasonic JD850M £4550	Panasonic IDST (UK) 0753 75841	64k RAM, 8085A, 4k PROM, dual 8" FD, JD850M (2Mb), 24 x 80, 3 x RS232, p/p	CP/M, Basic, A, Micro-Cobol	Option 8.4Mb HD.
Rair Business Computer £5250	Rair 01-836 6921	256k-1024k RAM, 8088 + 8085, 19Mb HD, one 5¼" FD (1Mb), 4 x RS232	Choice of O/S & languages	256k RAM expansion, colour work-stations.
Research Machines 380Z £1867	Research Machines 0865 249866	32-56k RAM, Z80A, dual 5¼" FD (300k), RS232, p/p	Ex Basic, A, T/EU, CP/M, Fortran, Cobol, Algol, Pascal	Hi-res colour graphics. Many possible systems, 56k RAM & dual 8" FD (1Mb) option.
Research Machines Link 480Z £560	As above	32-64k RAM, Z80A, C, 2 x s/p, CP/M 5¼" dd	Basic, T/E & other languages	Hi-res colour graphics, network stations.
Sage II £5445	Micro APL 01-622 0395 or TDI 0272 276447	512k RAM, 2 x RS232, 2 x 720k disks, APL 68000 under Mirage	Free UCSD P system with Basic, Fortran & Pascal	One year's free onsite h/w maintenance.
Sage 1V £4850	As above	128k-1Mb RAM, 68000, 1-4 HD, (5-50Mb) 1-2 FD (640k) 6 x RS232, p/p	Many O/S & languages	Price includes one year's service and s/w bundling.
Sanyo MBC 3000 £2250	Logitek 01-723 0012/3	64k RAM, 2 x 8085A, 2 x 8" FD (2Mb), p/p, 2 x s/p	CP/M + S Basic	
Sanyo MBC 4050 £2450	As above	128k RAM, 8086, 2 x 5" FD (1280k), p/p, s/p	As above	512k optional
SEED System 1 £2000	SEED 0543 378151 (direct only)	32k-56k RAM 6800 5" or 8" FD Dual s/p, p/p	DOS: Basic: M/A: T/E: CBasic	Graphics prom prog A-D/D-A 12 month warranty.
SEED System 19 £1304 64DS5	SEED 0543 378151 (5-20)	64k RAM 6809 based dual mini FD. One SASI interface 3 x s/p, p/p	Range of languages	Commercial applications packages. 12 month warranty.
SEED System 19 £2000+	SEED 0543 378151 (5-20)	64k–1Mb 16k EPROM + 6809, mini FD, FD HD, cartridge	Wide range	Commercial applications packages. Multi-user up to 12 term. A-D/D-A. 12 month warranty.
Sharp MZ-80A £549	Sharp Electronics 061-205 2333	48k RAM, Z80, 25 x 40, C, p/p, options: single 5¼" FD, dual 5-FD, RS232	Basic, CP/M, A, Pascal, Fortran, Cobol	Expansion unit needed for disks (£100), Low-res 80 x 50 graphics, loudspeaker, numeric pad.
Sharp MZ80B	As above	64k RAM, Z80A, C, 25 x 80, RS232, p/p, ds dd, (560k)	Basic, A, Pascal F Dos	Hi-res graphics, options 5¼" FD (560k), 80 Cps printer.
Sharp MZ3541	As above	Z80A, 128-256k RAM, ROM 8k, p/p, RS232C Dual ds dd (320k)	Basic	
Sharp MZ-711	As above	Z80A, 64k RAM, 40 x 25, TV, printer/C int		Optional equipment — colour plotter, printer, data recorder.
Sharp PC5000 (portable)	As above	8088, 128-256k RAM	MS-DOS, Basic	Liquid Crystal Display, peripheral options.
Sig/Net S3 £1290	Shelton 01-2786272	64-256k, Z80B/8088, dual 5¼" FD (200k), 2 x RS232	CP/M, Basic, Cis Cobol, MCNOS	Disk options to 56Mb + multi-user options.
SWTP F/09 £3050	SWTP 0733 234433	64k RAM, 6809, up to 4 FD/HD drives, max 48Mb, 6 x s/p, p/p, 82 x 25	Flex OS, AT/EWP Basic, Forth, Pascal	Applications packages available for single user.
Sord M5 £189.95	Sord (UK) Ltd 01-930 4214	20k Z80A	Falc, Basic-I, Basic-G	

List of Abbreviations

A	Assembler	G/C	Graphics card	M/A	Macro assembler	s/w	Software
BT	Benchtested	H	Hardware	N/A	Not available	S/P	Serial port
C	Cassette	H/D	Hard disk	N/P	Numeric pad	T/E	Text editor
E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	p/p	Parallel port	U	Utility

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Machine & Price	Main Distributor	Hardware	Software	Miscellaneous
Sord M23 MKV £2850	As above	128k RAM, Z80A 2 x 1M 8" F/D (80 x 25) 2 RS232C p/p	Many languages	Optional SB – 80 Optional SGL graphics
Sord M23P £1800	As above	128k RAM: Z80A Liquid Crystal Display (80 x 8) Dual micro F/D (290k) 2RS232C p/p	Many languages	Optional SB – 80 Optional SGL graphics
Sord M343 MKV £6100	As above	256k-768k RAM, 8086 128 x 64, 4RS232C ports p/p 2 x 1.2Mb 8" FD	Many languages	Full Hi-res graphics. SGL Language. Data comms feature.
SWTP S/09 £5110	As above	64-768k RAM, 6809, 2.5Mb FD, 80Mb HD, tape streamer	Many languages & s/w packages	Expand to 12 users, modem link.
SWTP S + £7260	As above	256k-1Mb RAM, 6809, 20Mb-220Mb	O/S Uniflex, AS, S/09	Expand 24 users, modem link.
TA Alphatronic £1895	Triumph Adler 01-250 1717	64k RAM, 8085A, dual 5¼" FD (1Mb), HD (5Mb) (P4) 12', 24 x 80, s/p, p/p	CP/M, Basic, etc	P2, P3 link to Micromite LAN, option of 8088 on P3, P4.
TA Alphatronic P30, P40 £2495	As above	64-128k RAM, 8085A/8088, dual 5¼" FD (1Mb), HD (5Mb) P40, 24 x 80, p/p, s/p	CP/M, Basic etc	P30 links to Micromite LAN, (up to 340Mb HD).
TRS 80 100 Portable £499-649	Tandy 01-836 1327/0599	80C85, CMOS, 8 x 40, 8-32k RAM, p/p, RS232C	5 ROM Based progs	Liquid crystal display.
TRS 80 4 £749-£1499 (3 models)	As above	C based 16-64k RAM, 2/1 disk 64-128k, 5¼" dd 184k, disk-advanced Z80A	O/Ss, Advanced Microsoft Basic	
TRS 80 12 £2399-£2999	As above	Z80A, 80k RAM, 1/2 double sided dd 8" slim line floppies (1.25Mb), 80/40 x 24, RS232C x 2, p/p	Interpretive Basic + others	
TS100 Multi-user £2300	Transam Microsystems Ltd 01-404 4554	64k cardframe, Z80A board, dual 5¼", 790k FD, 2 x s/p	CP/M single user, MP/M multi-user, 7 languages	HD available, C card up to 4 FD, up to 8 users MP/M.
Tuscan CP/M System from £1699	As above	60k RAM, Z80A, Dual 5" FD (190k each), p/p, Dual RS232, 8 x 24, S100 BUS	CP/M + 7 languages	Many options.
Wilcox 1000	Wilcox comp's (0978-83) 4866	Zilog Z80, 32-64k, 2 8'ds, dd flexible disk drives (2.4Mb), 4 x RS232C	Wilcox multi-tasking Multi-user O/S	1 x HD (40Mb) may be connected to system. Options available.
Wilcox 2000	As above	8-bit 6502, 30-512k RAM, 2 x 5¼" double sided dd (320k each), or 1 of above and HD (5/10Mb), p/p, RS232, 80/132 x 24	40 systems, MBasic CBasic, Cis Cobol, C	Z80A or 8080 used under s/w control for applications programs.
Windrush 6809 £2418-£5803	Windrush Micro Systems (0692) 405189	56k, non volatile CMOS RAM, 6809, DMA HD controllers, 2 x s/p, 2 x pp	Much software	Designed ad development system for industrial control/comp station for commercial OEMS.
Zenith ZF 120-22 £590	Zenith Data Systems 0452 29451	224k RAM, 8- & 16-bit processor, 2 x 320k FD, 2 x RS232, p/p	CP/M, ZDOS ZBasic	10Mb HD available and multi-user system.
Zenith ZF 120-22 £2590	As above	192k RAM, 8- and 16-bit processor, 2 x 320k FD, 2 x RS232, p/p colour optional	As above	As above
ZX81 £39-£95	Sinclair (0276) 685 311	1-16k RAM, Z80A, C int, TV, full keyboard 44 pin expansion port	Basic 8k ROM	Advanced chip design, printer available.
ZX Spectrum £95-£129	As above	16-48k RAM, Z80A, 16k ROM, TV, C.	Basic	Option - 32k RAM, RS232, Microdrive disks.

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E	Extensive	I	Introductory	O/S	Operating system	TBA	To be announced
F/D	Floppy disk	Int	Interface	p/p	Parallel port	U	Utility

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.

● TANDY TRS-80 Model III, 48k, 2 internal disk drives, almost unused, stock control instruction and disk owners manual. Total cost £1700, would accept £1200. Tel: 01-467 1752 (day), 01-662 4039 (eve).

● VIDEO GENIE EG3003. 16k, built-in cassette leads, manuals, £150 ono. Expander box and interface for disk and printer, 48k, £150 ono. NewDos 80 manual. Offers please. Tel: Soton (0703) 695049 (eve).

● NEWBRAIN AD. Including manual, 2 cassette leads, printer lead, beginners guide and tape, £160 ono. Tel: Harpenden (05827) 5679.

● SHARP MZ80K. 48k RAM, complete with monitor and cassette deck. Basic manual and tape. Absolutely superb condition and working order. Realisticly priced at £170, delivery arranged. Tel: 01-892 2730 after 7pm.

● VIDEO GENIE. 16k computer with leads, software and integral backing storage: see *PCW* February issue page 93. £199. Tel: 08832 4115, Hamilton.

● TRS-80 Model 1, Level 2. New 80-track disk drive. Loads of software. Bargain £650. Tel: 01-947 8442, Jonn.

● DAI. 48k personal computer, Hi-res, 16-colour graphics, stereo sound output, assembler, games, demo tapes, magazines. £175 ono. Tel: (0325) 320263.

● TRS 80, 16k, Level 2. With monitor, cassette and all leads, manual, books and 50 tapes of programs. Good games, utility and educational. Good condition. £275 ono. Tel: 01-898 7957 (eves).

● APPLE II. 48k, £300. Tel: Bookham 53974 after 7pm or weekends.

● SHARP MZ80K. 48k, built-in monitor and cassette recorder. With Basic, Pascal, manuals, games. Very good condition as hardly used. £230. Tel: Brentwood (0277) 224336.

● TRS-80. 16k Model 1, Level II. Green monitor, original boxes, software & books. All leads best over £200. Also Fidelity Challenger Chess, ten levels. Offers over £45. Tel: York (0904) 760889.

● TUSCAN. CP/M business computer, twin 5¼in ssdd disk drives, 64k static RAM, 80×24 display. Hardly used, £1000 (or would exchange for BBC(B) with disks + cash adjustment). Tel: Staines 58708.

● VIDEO GENIE, EG3003. With integral cassette deck and meter, games and some educational software. Very good condition. £110 ono. Tel: Thorne, Staines 58708.

● SHARP MZ-80A, 48k RAM, 2 Basics, Assembler, Disassembler + games. Cost £680. 12 months old. £350 ono for quick sale. Tel: Goole 861384.

● CAN ANYONE offer old and/or faulty VIDEO GENIE or TRS80 cheaply for project. Replies to F.H. Gomberg, Oriel High School, Gorleston, Suffolk NR31 7JJ.

● TRS-80, Model III. 64k RAM. Complete integrated system with twin integral Cumana double density disk drives and Microline, 80 matrix printer. Excellent working order/reliability. £500 complete. Tel: (061) 832 4847 (day), Mr. Cohen.

● DATAMINI. 64k, new micro. 2 Teac drives, 80 col, CPM compatible, Apple programs for use. Monitor or TV £695. Tel: Collier, 01-937 7805 (eve).

● TRS-80 Model I. 48k, Level II. Monitor, CTR 80, expansion interface, sound generator. Many programs including Editor, Assembler, Monitor 3, Impakt, Enhanced Basic, System Savers, APL 80 + many games. £230. Tel: Lodge Hill 42484 (eve).

● VIC-20. Super expander, 16k RAM, motherboard & joystick, 10 cartridges, 20 cassettes, book & magazines. All vgc & guaranteed. Cost £300+. Want £130 or £150 inc b/w TV. Tel: Rick on 01-444 9132 (eve please!).

● VIC 20, C2N, S.Exp, £40 software, 3 cartridges, prog manual, intro, Basic 1, joystick. All boxed as new, sell for only £135 ono, for quick sale. Will split. Tel: after 5pm (0460) 73509.

● MICROWRITER manuals, interface, green screen monitor, £150. Tel: (01-351 0356 after 2pm.

● NASCOM 2. 2 RAM boards 48k, AVC board, I/O board, GM 809 controller, Pertec 400k disk drive, PolyDos, other software. Will split, offers. Tel: (Birmingham) 021-429 2420 after 6.30pm.

● SHARP MZ80K. 48k, reset switch, hi-res graphics. Basic, M/C, Forth, Basicode 2 languages and manuals. Games, Flight Simulator, Wordpower, Datapower utilities. Printer, Epson MX80, dustcovers, users notes. £425 ono. Tel: (0277) 222943.

● HAVE SOLD Apple. Software to clear half price: Dakin 5, EZDraw, AppleDos, Toolkit, Electric Duet,

TRANSACTION FILE

Wizardry, Prisoner 2, Sargon, Gorgon, Choplifter, Cyber Strike, Wizard Princess, Orbitron, Phantoms Five, Flight Simulator, Olympic Decathlon. Tel: 01-257 4012.

● MICROWRITER. Portable word processor, TV interface, CBM 8050 disk-dump software, B300 interface, worth £800, sell £250 or swap 4040 disk drives. Dallas. Tel: 01-636 3740.

● NEWBRAIN AD. 32k with 64k expansion box. Sanyo hi-res monitor with tapes, books. 6 months old with guarantee. Owner leaving country. £550. Will split. Tel: 021 354 3721 (eve).

● APPLE IIe, 80 col, 128k, monitor III, disk drive, Epson FX80 printer grappler+, Apple writer IIe. Various utilities and games. Manuals, books. All £1650. Also mountain music system £175. Tel: (01)267 3077 (eve).

● ANADEX DP800 printer. Centronics and RS232 interfaces. vgc £75. Also DAI computer with AMD 9511 maths processor, £150. Tel: Dave Robinson, 01-790 0066 (day), 01-790 0075 (eve).

● CASIO FX-702P. Basic programmable pocket computer + mini electro printer FP-10 + program library. As new £105. S.M. Jenkins, C11 Angel Court, Trinity College, Cambridge.

● VIDEO 100 B/W 12in monitor, £50 ono. Compukit, cased, I/O board, light pen, £60 ono. Power supply, many voltages. Very high current 110 vol, but with 15A 240-110V transformer. £50 ono. Tel 01-390 0156 (Surbiton).

● TRS-80 Model I. Level 2, 48k, expansion unit, VDU, cassette recorder, JPC high-speed cassette unit, with original boxes, manuals and games/utility software, £299. Tel: Bishop's Stortford (0279) 54157.

● Marriage forces clearout! ORIC-1 48k, £85. ORIC printer, £100. Software ½ price or less. Video Genie 16k, software, printer cable £70. TRS-80 printer interface £15. Barrett, 01-741 9551 (day) 01-651 4249 (eve), Croydon.

● ITT 2020, Apple II. 32k, with disk drive and DOF 3.2 + software. £400 ono. Tel: Southend-on-Sea 204901.

● BBC model B. Watford disk filing system, 200k Teac disk drive & disks, Datex tape recorder, joysticks, games, magazines. Selling for £650. Tel: 01-602 0277, London (eve). Please ask for Mike.

● WESTERN DYNEX. 5Mb fixed, 5Mb removable, hard disk, interface and software to allow up to 4 TRS-80 Model II's to access simultaneously. £750. 14in disk packs also avail. Tel: 031-553 2662.

● TRS-80 Model 2. 64k, integral VDU +8in disk drive. Good condition, bargain at £750. Also expansion 1-drive unit £450 ono, 132-col dot matrix parallel printer & cable, £350. Tel: (0620) 860589.

● SHARP MZ-80A, 4 MHz upgrade, 2 Basics, Forth, Zen, many games in original packing. House move forces sale. £350 ono. Harding, Tel: (0734) 791260 (eve).

● GENIE I, 16k RAM, many books and software tapes. £150 ono. Tel: Great Missenden (02406) 3880 (eve/weekend).

● SHARP MZ-80K. 48k, 60+ games programs (over £100's worth bought). CP/M card (without disk drives), reset switch, Basic +, dustcover, manuals, magazines, etc. Bargain £480 ono. Tel: (0482) 845851.

● NEC APC. 16-bit business micro, 2byte storage, beautiful machine. Hardly used, must sell. Includes word processor, software. £400. Less new price. Tel: Oxford (0865) 511493 to view. Robert Crocker.

● TEC 40 CPS daisywheel printer. RRP £1400+. As new £800 ono. Apple II, VisiCalc £60, Visitrend/Plot £100, Videx 80 col card £110. Verbatim Datalife 5¼in SS DD, per box of 10 £10. Tel: 01-272 3550.

● ATARI business programs. PAYE Sales Ledger, Purchase Ledger and Stock Control. Normally over £125 each. All 4 for £200. Tel: (0992) 468870 (eve).

● ATARI games on cassette and disk. All new, not pirates, £9.50 each. Le-stick £5. Letter and Data Perfect 40/80-col versions on disk £50. Tel: (0992) 468870 (eve).

● ATARI 800. 48k, 80-col board, d/drive, cass/rec, voice synthesiser, remote keyboard, j/sticks, green monitor, 40/80-col letter and data perfect. 100 disks and accessories. Best offer secures. Tel: (0992) 468870 (eve).

● NASCOM 2. 48k, with Castle interface, in Kenilworth case. Software, full manual and Sharp cassette included. All as new. £250. Tel: Nuneaton (0203) 386564 (eve).

● TELEVIDEO TS 802. CP/M, twin 400k disk drive (64k RAM). Computer plus Epson MX80FT Dot Matrix printer for sale. Only 18 months old. Pristine condition £1000 ono. Morison. Tel: 01-876 4646.

● IBM PC. 320k RAM, dual 320k disk, IBM colour monitor, FX80 printer, quadboard, graphics card. Much software including Wordstar, Supercalc, dBase 2. Total value £6800, selling for £3750. Tel: Isle of Wight 64055.

● TELEVIDEO intelligent terminal 912C. £250 ono. Modems, Racal V21 £175. V22 £195. VIC-20, tape, monitor, 27k RAM. Many programs, books, £120. IBM PC colour, 320k. FX80 software. £3750. Tel: Isle of Wight 64055.

● ACT Sirius. 2.4M disk capacity (July 1983). Victor graphics, Wordstar, Supercalc, Tate dBase, MS-DOS86, configurator CHR, set toolkit, CP/M86, configurator toolkit, £2800. Also new MX-F/T80 Epson printer, £220. Tel: (0749) 75783.

● VIDEO GENIE EG3003. 16k RAM, 12k ROM, with 9in b/w VDU and Tandy DMP100 printer. Cables, manuals, £300 ono. Beckenham, Kent. Tel: 01-466 6677 (eve only)

● NEWBRAIN A. £160 ono. Epson RS232 interface, £35 ono. Perfect Calc, Writer, Speller and Filer for Torch. Offers. BrainWriter tape, £300 ono. Tape recorder £20 ono. Tel: (work) 01-300 2450 (home) (047485) 3645.

● MICROTAN 65, TANEX, 40k TanRAM, TUC Eprom storage, 12 slot mother-board, 19in rack + PSU, keyboard & cassette recorder, S/W-H/W manuals, mags etc. All options. £400 ono. Mark tel: (08894) 76119 (office hours), Rugeley, Staffs.

● OSBORNE 1. Excellent condition, CP/M, Wordstar, MailMerge, Supercalc, Basic & CBasic, TV adaptor, 10 diskettes, comprehensive manual, £845 ono. Also Tandy PC-2, mint condition, hardly used, complete with manual £50 ono. Tel: Upminster (04022) 23886.

● Memotech MTX512. Complete plus £45 software and joystick. Exchange for BBC micro O/S 1.2 or sell. Tel: Andover (0264) 54038.

● VIC 20 Plus cassette recorder, for sale, £80. Tel: Peter 01-802 3946.

● VIDEO GENIE. 48k. Built-in cassette, expander box, disk drive, Microline 80 printer. Software includes professional database plus NewDos operating system. Many books £650 ono. Tel: Saltash 7010, Mr Fox.

● 20 Verbatim 196 DPI. £40. Less than 6 months old. Tel: 01-459 6450.

● 6 VOLUMES *PCW*. From Vol 1, No 1, 1978 to Vol 6, No 12, 1983. All in immaculate condition, neatly bound. Tel: (0533) 357487. Mr Boreham, 42 Campion Walk, Leicester LE4 0PD.

● VISICALC for APPLE III, new, unregistered, £30. Also C-Basic and Calcstar for North Star Advantage. Please tel for details, 01-546 9944.

● WANTED — Plotter. HP7470A or similar with serial interface. Tel: (024358) 349 after 6pm.

● SHARP MZ-80K, 48k RAM, inbuilt monitor and cassette. Software, Basic, Zen, Assembler/editor, debugger with manuals, monitor, listing and some games. Original packing, £275 ono. Tel: Church Stretton (0694) 723248, Shropshire.

● VIDEO GENIE, expansion interface and twin Olivetti disk drives, + software, will sell separately. Best offer over £200 secures. Tel: (0978) 756117.

● SHARP MZ-80K, 48k. Inbuilt screen and cassette drive. Also Basic cassette manual and software including Football Manager, Colditz, Home Accountant and many others. £230. Tel: East Grinstead (0342) 314603.

TRANSACTION FILE ADVERTISEMENT FORM

All Transaction File ads must be submitted by readers on this form or a photo-copy of this form. Maximum 30 words. Print one word per box, very clearly. Name, address and/or telephone number must be included in the 30 words. All ads must be accompanied by a flat fee of £2.50. Make cheques or POs payable to Personal Computer World. Ads accepted from private readers only. Ads cannot be repeated (unless sent in on another form) and we cannot guarantee to print an ad in any specific issue. Please help our typesetter to help you by printing your ad very clearly. Send form to: Transaction File PCW, 62 Oxford Street, London W1A 2HG.

Please find enclosed my cheque/PO for £2.50 for the following Transaction File ad.

ACC NEWS

Rupert Steele explains the objectives of the Association of Computer Clubs and provides a round-up of new computer clubs nationwide.

The ACC, or Association of Computer Clubs, is a body of local and national computer clubs around the country. It looks after various liaison and coordination functions as directed by its Council, which consists of representatives from all affiliated clubs. The main activities are:

1 Information and assistance in setting up and running a local computer club. Anyone considering starting a club can obtain a copy of the Club Information Kit by writing to me (at the address below). We also have an insurance scheme for affiliated clubs; by obtaining a standard policy on a block basis, the cost of cover has been cut to a very low level.

2 The operation of ClubSpot 800 on Prestel. This database is part of the Micronet 800 database and consists of a wide variety of information offered by computer clubs and related organisations, including a news magazine and David Annal's art gallery, as well as more conventional club information. If you would like to edit your own information on ClubSpot, write to me for information.

3 Publicity for computer clubs. The ACC runs a national clubs' database, which is thought to be the most up to date list of computer clubs in the UK. This list is available on a computer system at major computer shows, so that visitors can contact their local club.

4 Stands at computer exhibitions. The ACC organises club stands at a number of computer shows; where

ACC NEWS

there is a 'club avenue' in a show, it's likely that the ACC will have negotiated free (or extremely cheap) stands, and assigned them among National User Groups. But the ACC cannot do anything for your club unless notified of its existence. Make sure you write to me with news of what you're up to.

Club news

Allan Kynes writes from 6 South Lochside, Lerwick, Shetland ZE1 0RA to tell me of the Sound Computer Club, which claims to be the most northerly computer club in the UK. The club meets in the Sound School, Lerwick, every second Thursday. While many of the members are school pupils, all are welcome. Call Allan on (0595) 4687 for more information.

Also at the top of the map is the Kingsway Amateur Computer Club, which meets at the Kingsway Technical College, Old Glamis Road, Dundee. The club is most definitely open to all, not just Tech College students. Meetings are from 6.30 to 9pm in rooms C11 and C12 at the College. Contact the secretary, C Macleod, Flat 3A, 101 Peddie Street, Dundee, for more information.

Mr JW Bruce, of the National Engineering Laboratory, East Kilbride, Glasgow G75 0QU has started a computer club at the NEL. Mr Bruce will provide all necessary information.

Staying celtic: news from Wales. Allan Jones of 'The Island', 1 High Street, Connah's Quay, Deeside, Clwyd CH5 4DA writes to tell of the Clwyd '80 Computer Club. This meets on Thursdays at 7pm in the Deeside Community Centre, Queensferry, Deeside, Clwyd. The club has about 110 members, half of whom are juniors; it also produces a club magazine. For more information about Clwyd '80 Computer Club, write to Allan or call him on (0244) 816893.

Russell Neil Gibbs, of 153 Holly Road, Ty Sign, Risca, Newport, Gwent NP1 7HZ, writes to tell me about the club running at the Risca Youth and Community Centre. It meets on Tuesday evenings, and is for young people aged 14-21. Members of the youth centre are expected to pay the staggering fee of 10p a night to take part in the club. Write to Russell or contact the Community Centre (in Lyne Road, Risca). Tel: Risca 612487.

Also in Wales, John Dale, of 12 Poplar Road, Newtown, Powys SY16 2QG, writes to tell me of the Newtown and District Computer Club. Apart from the usual programme of meetings, this enterprising group has set up an advisory service for those proposing to buy computers, is running an exhibition and is looking into ways to prevent theft of equipment by circulating serial numbers and descriptions. For more information of the Newtown club, write to John or call him on (0686) 28715.

Brian Push is secretary of the Pencoed Amateur Computer Club. The club meets alternate Saturdays, 2-5pm, with attendance fee 50p per meeting, at the Pencoed Welfare Hall. For more information, contact Brian at 7 Duffryn, Pencoed, Bridgend, Mid Glamorgan CF35 6JL.

Now it's time to move to the Midlands. Jeff Perrins, of 34b Salop Street, Bradley, Bilston, West Midlands WV14 0TQ, is the secretary of the West Midlands Commodore Users Group. If you're interested in PETs, VICs or Commodore 64s, drop Jeff a line.

Mike Bedford-White wrote to me from 16 Westfield Road, Acocks Green, Birmingham B27 7TL. He runs the Acocks Green Computer Club, which has been running for about a year. If you are interested in this club, why not write to him?

Eric Deeson, of Highgate School, Birmingham B12 9DS runs the Educational ZX Users' Group, part of MUSE. Its aims are to organise the development of high quality ZX81 and Spectrum educational software for the MUSE library, and to assist with the acceptance of the ZX81 and Spectrum as valid resources for teaching in schools, colleges and the home. There is also a software library and a technical query service. So if you want to know about Sinclairs in education, send Eric two second class stamps (and your address, of course).

Mr CN Parry, of 16 Sackville Close, Stratford on Avon, Warwickshire has written to say that he's starting a computer club there. If you're interested in finding out more, you know what to do.

Michael Watts writes from 66 Northampton Road, Kettering, Northants to describe the new Kettering Micro Users' Group or K-MUG. Write or call (0536) 514381 for details.

Mr JEA Symondson of 46 London Road, Stapeley, Nantwich, Cheshire writes in about the Crew and Nantwich Computer Users Club. In addition to the usual club activities, the group runs an annual exhibition. Write for details.

Finally, Stuart Edinborough has written to request a further mention for the Hereford Amateur Computer Club. To find out more about HACC, contact Mr S Edinborough, 3 Warwick Walk, Bobblestock, Hereford HR4 9TG, tel: (0432) 269700. Alternatively, contact Mrs R Riley on Hereford (0432) 279302.

**For more information on the ACC, or to request a mention for you club, write to me:
Rupert Steele
17 Lawrie Park Crescent
London
SE26 6HH
Tel: (01) 778 6824

CTUK

Unfortunately, Computer Town UK! appears in a shortened form this month but Margaret Spooner's in-tray reveals that it's alive and kicking. (The full list of contacts' names and addresses will back in June.)

One of the most recent additions to the list of Computer Town contacts is in Newtown, Powys. Already established as the Newtown & District Computer Club, secretary John Dale writes that the club was formed in September 1983 and has held an exhibition at which computers from the club's own resources including BBC Micros, Spectrums, ZX81s, Texas Instruments and Commodore computers, plus machines from local companies were on display. More than 2500 people attended the exhibition over two days and a further larger show will have taken place by our publication date. John also says: 'We are running a Basic course at the local technical college (evenings) and organising visits to demonstrate computers to other organisations.' It sounds as if there is plenty of interest in micros in the Newtown area.

The future of the Tonbridge Computer Town is unsure at present because Brian Tayler has moved house: his new home address is listed among the

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CTUK

contacts so that interested parties can find out where the Computer Town will carry on — it may continue at Tonbridge, it may transfer to West Malling or there may even be Computer Towns at both venues. Further news when a final decision has been made.

And finally, the names of people who have requested guidelines because they are interested in setting up new Computer Towns. Get in touch with them and offer support if you live nearby and would like a Computer Town in your area. They are: Alfred O'Coyle, 22 Dover Flats, Old Kent Road, London SE1 (Tel: (01) 237 4125); John McCaffery, Reres House, Reres Road, Broughty Ferry, Dundee.

BENCHMARKS

A listing of the Benchmarks used when evaluating micros is given below. An explanation can be found in the December '83 issue.

```
100 REM Benchmark 1
110 PRINT "S"
120 FOR K=1 TO 1000
130 NEXT K
140 PRINT "E"
150 END

100 REM Benchmark 2
110 PRINT "S"
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
150 PRINT "E"
160 END

100 REM Benchmark 3
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/K*K+K-K
150 IF K<1000 THEN 130
160 PRINT "E"
170 END

100 REM Benchmark 4
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 K<1000 THEN 130
160 PRINT "E"
170 END

100 REM Benchmark 5
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K/2*3+4-5
150 GOSUB 190
160 IF K<1000 THEN 130
170 PRINT "E"
180 END
190 RETURN

100 REM Benchmark 6
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 220
170 FOR L=1 TO 5
180 NEXT L
190 IF K<1000 THEN 140
200 PRINT "E"
210 END
220 RETURN

100 REM Benchmark 7
110 PRINT "S"
120 K=0
130 DIM M(5)
140 K=K+1
150 A=K/2*3+4-5
160 GOSUB 230
170 FOR L=1 TO 5
180 M(L)=A
190 NEXT L
200 IF K<1000 THEN 140
210 PRINT "E"
220 END
230 RETURN

100 REM Benchmark 8
110 PRINT "S"
120 K=0
130 K=K+1
140 A=K^2
150 B=LOG(K)
160 C=SIN(K)
170 IF K<1000 THEN 130
180 PRINT "E"
190 END
```

DIARY DATA

Readers are strongly advised to check details with exhibition organisers before making arrangements to avoid wasted journeys due to cancellations, printers' errors, etc.

London	(Central Hall), Computer Fair. Contact: Computer Market Place Ltd, (01) 930 1612	19-23 April
West Midlands	(Solihull Conference Centre), Personal Computer Games Easter Show. Contact: S Ayling, (01) 636 6890	20-22 April
London	(Central Hall, Westminster), ACC Micro-Robotics Conference. Contact: Mr Moyle, (01) 777 9806	21 April
Wales	(Elephant & Castle, Newton, Powys), Mid Wales Computer Exbn. Contact: J Dale (0686) 28715	24 April
Birmingham	(NEC), Midland Computer Fair. Contact: Reed Exbns, (01) 643 8040	4-7 May
London	(Novotel), DEC User Show. Contact: EMAP, (0733) 63100	15-17 May
Bristol	(Exbn Centre), Micro City and Offices of the Future. Contact: Tomorrow's World Exbns Ltd, (0272) 292156	15-17 May
Paris	International Exhibition on Robotics, CAD/CAM Automation, Engineering in Automated Production. Contact: Sepic France, (1) 359 10 30	22-29 May

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An emphasis on utilities this month. Program of the Month is a cassette-based compiler for the TRS-80 and Video Genie. A set of graphics utilities is offered for the Sharp MZ-80K, plus a character definer for the Oric/Atmos.

Two automatic cassette indexing programs are included for the Oric and BBC, and Spectrum owners can enter the world of word processing with a cassette-based text editor. 'Marvin' provides an interesting variation on the Eliza program. If you've ever wanted your very own paranoid android to chat to, your search is over. This month's selection is completed by 'Deathwall' for the VIC-20 and a game of three dimensional noughts and crosses for the Commodore PET.

Incidentally, BBC 'Word' is, as promised, now available for direct downloading through Micronet 800; it's on page *70037# (then select option 1). This program is made available free of charge with the kind permission of the authors.



Games
Scientific/mathematic
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Program of the Month
TRS-80 and Genie Compiler
by Dennis Culver

'Compiler' is a utility program which converts Basic programs into machine code files. It runs on a 16k TRS-80 or Video Genie.

Basic programs are easy to write, but are inefficient in their use of memory and are slow to run. Compilers aim to give the best of both worlds, by allowing programs to be written in Basic and turned into machine code once completed.

To prepare the compiler, type in the first listing and CSAVE it as 'A'. Having verified the save (using CLOAD?), enter NEW, type in the second listing and CSAVE this as program 'B'. Program 'A' is the compiler itself, program 'B' a routine to save the newly compiled program to tape as a machine code file.

Once you have typed in and saved the two programs, the compiler is ready for use. To compile a Basic program, take the following steps:

1 *CLOAD program 'A'.*
2 *Type in the program to be compiled.*
3 *Place an END statement on a line of its own as the final line in your program — you must do this before attempting to RUN the program.*
4 *Test the program by RUNning it, carrying out any debugging as necessary.*
5 *CSAVE the program to tape and verify it; this is a precaution in case anything goes wrong during the compiling process, and also gives a copy of the source file in case you want to change the program at a later date.*
6 *Enter 'RUN 1000' as a direct command — this begins the compilation. The compiler will attempt to carry out a limited amount of error-checking but most errors will*

go undetected.

7 *Once the program has been compiled, CLOAD and RUN program 'B'.*
8 *Enter the filename as prompted.*
9 *Place a blank tape in the cassette player and press RECORD and PLAY.*
10 *Press RETURN when prompted to do so. The compiled program will then be saved to tape.*

Now switch the machine off, wait twenty seconds or so (to avoid blowing the fuse) and switch on again. The compiled program is now loaded just like any other machine code program using the SYSTEM command. All being well, the program will then run as before only very much faster. As an indication of the difference in speed between interpreted and compiled code, take a look at the following simple program:

```
100 CLS
110 IF X>127 THEN 180
120 IF Y>47 THEN 160
130 SET (X,Y)
140 Y=Y+1
150 GOTO 120
160 X=X+1
165 Y=0
170 GOTO 110
180 END
```

The program turns the screen white in as inefficient a manner as possible in order to test the compiler. The uncompiled code takes over a minute to run; the compiled version, three seconds!

Please note that any bugs in the original program will cause the compiled program to crash, possibly corrupting itself as it does so. For this reason, it is *vital* that you make and verify a copy of the source code as directed in step 5. Then, if the program does crash you need only CLOAD and debug it, then continue from step 6 (the compiler is saved and loaded with the source file automatically).

There are, of course, a few limits on the source code. These are:

(a) All program lines must be below 1000.
(b) The program is restricted to a maximum of 200 lines (multi-statement lines are allowed).
(c) No string variables are allowed! Only single letter (A-Z) variables are accepted and these are treated as integers. This obviously rules out certain types of program.
(d) Only a limited subset of Level II Basic is supported and restrictions apply to this subset.

The statements supported and the relevant restrictions are detailed below:

LET:	As standard (optional).
REM:	As standard (including the single quote abbreviation) but serve no purpose in compiled code. Since REMarks can only slow the program, these are best removed prior to compilation.
PRINT & PRINT @:	Only single items may be printed: each print item (for example, 'HELLO' or X) must have its own print statement separated by colons.
INKEY$:	This *is* allowed, but since only integer variables are supported everything following the INKEY$ statement is ignored and the line is evaluated as ASC (INSTR$).
GOTO:	As standard.
GOSUB-RETURN:	As standard.
IF-THEN:	The ELSE statement is *not* supported.
RND:	As standard.
CLS:	As standard.
PEEK/POKE:	As standard, but memory locations 16478 and 16479 are used by the compiler so must not be used by your program.
CHR$:	As standard.
SGN:	As standard.
ABS:	As standard.
SET:	As standard.
RESET:	As standard.
POINT:	As standard.
CLEAR:	May be used *only* to set all variables to zero.
STOP:	This will cause an abort to the interpreter returning you to command level, and so would not normally be used.
END:	This *must* be the final statement in your program, and should be on a line of its own.

The logical operators AND, OR and NOT are supported but the argument to NOT should not be enclosed by parentheses. All the arithmetic and relational operators are supported, but '<' is evaluated as '=<'.

From the above, it will be clear that the compiler is only of use on programs which are written with compilation in mind. Given this restriction, it is likely to prove an extremely useful addition to the program library of all Tandy/Genie owners.

```
1000 CLS:PRINT"BASIC COMPILER 1.3
                BY D. J. CULVER":PRINT
1010 Q=27000:M=16561:GOSUB1480
1020 CLEAR100:DEFINTA-Z:B=PEEK(16548)+256*PEEK(16549)
1030 LO=27000:DIML(199),L1(199)
1040 FORM=LO+53TOLO+146:READX:POKEM,X:NEXT:M=LO+147
1050 PRINT:PRINT"PRODUCING CODE FOR LINE";:GOTO1070
1060 I=PEEK(B):B=B+1:IFI=32THEN1060ELSERETURN
1070 L(LN)=PEEK(B+2)+PEEK(B+3)*256:L1(LN)=M:LN=LN+1:NL=PEEK(B)+256*PEEK(B+1)
1080 NL=PEEK(NL+2)+256*PEEK(NL+3):B=B+4
1090 IFLN=200THEN2410ELSEGOSUB1060
```


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PROGRAMS

```
1100 IFL(LN-1))999THEN2430
1110 PRINT@279,L(LN-1);
1120 IFI=178THEN1710ELSEIFI=128THEN2280
1130 IFI=141THEN1870ELSEIFI=145THEN1900
1140 IFI=146THEN1930ELSEIFI=147ORI=251THEN1940
1150 IFI=143THEN1950ELSEIFI=148THEN2080
1160 IFI=132THEN2040ELSEIFI=177THEN2050
1170 IFI=131THEN2090ELSEIFI=130THEN2150
1180 IFI=184THEN2160
1190 IFI()ASC(":")THENGOSUB1210
1200 IFI=0THEN1070ELSEIFI=ASC(":")THENGOSUB1060:GOTO1120ELSE2400
1210 IFI=140THENGOSUB1060
1220 IFI(ASC("A")ORI)ASC("Z")THEN2400ELSEV=(I-ASC("A"))*2
1230 GOSUB1060:IFI()213THEN1670ELSEGOSUB1370
1240 IFI()0ANDI()ASC(":")THENGOSUB1260
1250 POKEM,34:Q=V:M=M+1:GOSUB1470:RETURN
1260 POKEM,229:O=I:M=M+1:GOSUB1370:POKEM,209:POKEM+1,235:M=M+2
1270 IFO=206THENPOKEM,167:POKEM+1,237:POKEM+2,82:M=M+3:RETURN
1280 IFO=205THENPOKEM,25:M=M+1:RETURN
1290 POKEM,205:M=M+1
1300 IFO=207THENPOKEM,242:POKEM+1,11:M=M+2:RETURN
1310 IFO=208THENQ=LO+102:GOSUB1480:RETURN
1320 IFO=210THENQ=LO+53:GOSUB1480:RETURN
1330 IFO=211THENQ=LO+60:GOSUB1480:RETURNELSE2400
1340 IFI)=ASC("A")ANDI(=ASC("Z")THEN1460ELSE1410
1350 IFI)=ASC("A")ANDI(=ASC("Z")THENGOSUB1460:POKEM-3,58ELSEGOSUB1410:POKEM-3,62
:M=M-1
1360 RETURN
1370 GOSUB1060:IFI)=ASC("A")ANDI(=ASC("Z")THEN1460
1380 IFI=222THEN1520ELSEIFI=229THEN1540
1390 IFI=215THEN1630ELSEIFI=217THEN1640
1400 IFI=203THEN1610ELSEIFI=198THEN1560
1410 IFI=206THENGOSUB1060:GOSUB1420:Q=-Q:M=M-3:GOTO1430
1420 IFI(ASC("0")ORI)ASC("9")THEN2400ELSEA$="":GOSUB1440
1430 POKEM,33:M=M+1:GOTO1480
1440 IFI)=ASC("0")ANDI(=ASC("9")THENA$=A$+CHR$(I):GOSUB1060:GOTO1440
1450 Q=VAL(A$):RETURN
1460 Q=(I-ASC("A"))*2:POKEM,42:M=M+1:GOSUB1060
1470 Q=Q+LO
1480 POKEM,QAND255:Q1=(QAND-256)/256:IFQ1(0THENQ1=256+Q1
1490 POKEM+1,Q1:M=M+2:RETURN
1500 GOSUB1060:IFI()ASC("(")THEN2400ELSE1060
1510 IFI()ASC(")")THEN2400ELSE1060
1520 X=LO+112:GOTO1650
1530 FORQ1=1TOLEN(A$):POKEM,ASC(MID$(A$,Q1,1)):M=M+1:NEXT:RETURN
1540 GOSUB1500:GOSUB1340:GOSUB1510
1550 POKEM,110:POKEM+1,38:POKEM+2,0:M=M+3:RETURN
1560 GOSUB1500:GOSUB1350
1570 POKEM,71:M=M+1:IFI()ASC(",")THEN2400
1580 GOSUB1060:GOSUB1350
1590 A$=CHR$(38)+CHR$(0)+CHR$(205)+CHR$((LO+79)AND255)+CHR$(((LO+79)AND-256)/256
)+CHR$(42)+CHR$(33)+CHR$(65)
1600 GOSUB1530:GOTO1510
1610 GOSUB1060:GOSUB1340:POKEM,124:M=M+1
1620 X=LO+140:GOSUB1660:POKEM,43:M=M+1:RETURN
1630 X=LO+125:GOTO1650
1640 X=LO+137
1650 GOSUB1500:GOSUB1340:GOSUB1510
1660 Q=X:POKEM,205:M=M+1:GOSUB1480:RETURN
1670 IFI()ASC("$")THEN2400ELSEGOSUB1060
1680 IFI()213THEN2400ELSEGOSUB1060
1690 IFI()201THEN2400ELSEA$=CHR$(205)+CHR$(227)+CHR$(3)+CHR$(38)+CHR$(0)+CHR$(11
1)
1700 GOSUB1530:GOSUB1250:GOTO1940
1710 SP=0:GOSUB1060:IFI()ASC("@")THEN1750
1720 GOSUB1060:GOSUB1340:IFI()ASC(",")THEN2400
1730 POKEM,17:POKEM+1,0:POKEM+2,60:POKEM+3,25:M=M+4
1740 Q=16416:POKEM,34:M=M+1:GOSUB1480:GOSUB1060
1750 IFI()34THEN1770ELSEPOKEM,205:M=M+1:Q=LO+67:GOSUB1480
1760 I=PEEK(B):B=B+1:IFI()34THENPOKEM,I:M=M+1:GOTO1760ELSEPOKEM,0:M=M+1:GOSUB106
0:GOTO1810
1770 IFI()247THEN1850
1780 GOSUB1500
1790 GOSUB1350
1800 POKEM,205:POKEM+1,51:POKEM+2,0:M=M+3:GOSUB1510
1810 IFI=ASC(";")ANDSP=0THENGOSUB1060:GOTO1200
1820 POKEM,62:IFI()ASC(";")THENPOKEM+1,13ELSEPOKEM+1,32:GOSUB1060
1830 POKEM+2,205:POKEM+3,51:POKEM+4,0:M=M+5
1840 GOTO1200
1850 GOSUB1340
1860 POKEM,205:Q=LO+87:M=M+1:GOSUB1480:SP=1:GOTO1810
1870 POKEM,195:M=M+1
1880 GOSUB1060:A$="":GOSUB1440:IFA$=""THEN2400
1890 GOSUB1480:GOTO1200
1900 GOSUB1060:A$="":GOSUB1440:IFA$=""THEN2400
1910 X=Q:POKEM,33:M=M+1:Q=M+6:GOSUB1480:POKEM,229
1920 POKEM+1,195:M=M+2:Q=X:GOSUB1480:GOTO1200
1930 GOSUB1060:POKEM,201:M=M+1:GOTO1200
1940 GOSUB1060:IFI()0THEN1940ELSE1200
1950 GOSUB1060:GOSUB1340
1960 X=I:GOSUB1060:IFX=214ANDI=212THENX=1:GOSUB1060
1970 POKEM,235:M=M+1:GOSUB1340
1980 IFI()202THEN2400
1990 POKEM,183:POKEM+1,237:POKEM+2,82:M=M+3
2000 IFX=214THENPOKEM,250ELSEIFX=213THENPOKEM,194ELSEIFX=212THENPOKEM,242ELSEIFX
=1THENPOKEM,202ELSE2400
2010 Q=NL:M=M+1:GOSUB1480:GOSUB1060
2020 IFI(ASC("0")ORI)ASC("9")THEN1120
2030 B=B-1:I=PEEK(B):IFI=202THENB=B+1:GOTO1870ELSE2030
2040 POKEM,205:POKEM+1,201:POKEM+2,1:M=M+3:GOSUB1060:GOTO1200
2050 GOSUB1060:GOSUB1340:IFI()ASC(",")THEN2400
2060 GOSUB1060:GOSUB1350
2070 POKEM,119:M=M+1:GOTO1200
2080 GOSUB1060:POKEM,33:POKEM+1,204:POKEM+2,6:POKEM+3,233:M=M+4:GOTO1200
2090 S=128
2100 GOSUB1500:GOSUB1350
2110 POKEM,71:M=M+1:IFI()ASC(",")THEN2400
2120 GOSUB1060:GOSUB1350
2130 A$=CHR$(38)+CHR$(S)+CHR$(205)+CHR$((LO+79)AND255)+CHR$(((LO+79)AND-256)/256
)
2140 GOSUB1530:GOSUB1510:GOTO1200
2150 S=1:GOTO2100
2160 GOSUB1060:POKEM,33:M=M+1:Q=LO:GOSUB1480
2170 A$=CHR$(6)+CHR$(52)+CHR$(54)+CHR$(0)+CHR$(35)+CHR$(16)+CHR$(251)
2180 GOSUB1530:GOTO1200
2190 DATA122,164,103,123,165,111,201
2200 DATA122,180,103,123,181,111,201
2210 DATA225,126,35,183,40,5,205,51,0,24,246,233
2220 DATA229,197,33,140,24,195,80,1
2230 DATA34,33,65,205,189,15,126,183,200,205,51,0,35,24,247
2240 DATA235,205,144,36,42,33,65,195,127,10
2250 DATA34,33,65,205,201,20,205,127,10,42,33,65,201
```

```
2260 DATA124,183,93,33,255,255,248,179,35,200,35,201
2270 DATA124,183,240,47,103,125,47,111,35,201
2280 POKEM,195:POKEM+1,204:POKEM+2,6
2290 PRINT@256,"CODE PRODUCTION COMPLETED      "
2300 PRINT:PRINT"SETTING JUMPS":LS=M+2:FORX=LO+147TOM-1
2310 PRINT@397,X;
2320 S=PEEK(X):IF(S=195ORS=242ORS=194ORS=214ORS=250ORS=202)AND(PEEK(X+1)+PEEK(X+
2)*256(1000)THEN2360
2330 NEXT:M=16526:Q=LO+147:GOSUB1480
2340 FORM=LOTOLO+52:POKEM,0:NEXT:M=16478:Q=LS:GOSUB1480
2350 PRINT:INPUT"PRESS (ENTER) TO RUN MACHINE CODE";A$:X=USR(0)
2360 X1=PEEK(X+1)+PEEK(X+2)*256:S=0
2370 IFL(S)=X1THEN2390
2380 S=S+1:IFS=LNTHEN2420ELSE2370
2390 Q=L1(S):M=X+1:GOSUB1480:GOTO2330
2400 PRINT:PRINT"SYNTAX ERROR IN LINE"L(LN-1):END
2410 PRINT:PRINT"TOO MANY LINES OF SOURCE TEXT":END
2420 PRINT:PRINT"LINE NUMBER"X1"NOT FOUND":END
2430 PRINT:PRINT"LINE NUMBER"L(LN-1)"TOO LARGE":END
LISTING 1
```

```
10 CLEAR300:CLS:INPUT"FILE NAME (1 TO 6 LETTERS)";A$
20 IFLEN(A$))6THEN10ELSEA$=A$+STRING$(6-LEN(A$),32)
30 FORX=1TO6:POKE16479+X,ASC(MID$(A$,X,1)):NEXT
40 PRINT"SETTING UP MACHINE CODE ROUTINE..."
50 X=26000:M=16561:GOSUB130
60 FORX=26001TO26110:READA$:PRINTA$;
70 U$=LEFT$(A$,1):IFU$)="A"ANDU$(="F"THENU=ASC(U$)-55ELSEU=VAL(U$)
80 U=U*16:L$=RIGHT$(A$,1):IFL$)="A"ANDU$(="F"THENL=ASC(L$)-55ELSEL=VAL(L$)
90 POKEX,U+L:NEXT:FORX=27000TO27052:POKEX,0:NEXT
100 X=26001:M=16526:GOSUB130
110 PRINT:INPUT"PRESS (ENTER) TO SAVE PROGRAM";A$:X=USR(0)
120 PRINT"SAVE COMPLETE":END
130 POKEM,XAND255:POKEM+1,(XAND-256)/256:RETURN
140 DATA2A,5E,40,E5,AF,CD,12,02,CD,87,02,3E,55,CD,64,02,06,06
150 DATA21,60,40,7E,23,CD,64,02,10,F9,21,78,69,D1,E5,EB,B7,ED
160 DATA52,44,4D,03,E1,04,05,28,09,C5,06,00,CD,E0,65,C1,18,F4
170 DATA41,0C,0D,C4,E0,65,3E,78,CD,64,02,21,0B,6A,7D,CD,64,02
180 DATA7C,C3,64,02,C3,F8,01,3E,3C,CD,64,02,78,CD,64,02,7D,CD
190 DATA64,02,7C,CD,64,02,85,4F,7E,23,CD,64,02,81,4F,10,F7,C3
200 DATA64,02
LISTING 2
```

Spectrum Text Editor

by CF Choo

'Text Editor' runs on either model Spectrum. It enables you to create, modify, print, save and load up to eight pages of text at a time.

Full instructions are contained within the program. One small point: the error message in line 220 should read 'File-name must be ten characters or *less*.' The program is designed for use with the ZX Printer.

```
  5 BORDER 0: PAPER 0: INK 4
 10 PRINT AT 5,4;"Welcome to word processor"
 20 PRINT AT 8,12;"C.F.Choo"
 30 PRINT AT 15,5; INK 6;"Press any key to start"
 35 DIM T$(5120): LET page=1: LET pagend=640*page
 40 IF INKEY$="" THEN  GO TO 40
 50 CLS
 60 PRINT "d : for description": PRINT : PRINT "ded : create new text file": PR
INT : PRINT "edit : present text file": PRINT
 62 PRINT "save : text file onto tape": PRINT : PRINT "load : text file from ta
pe": PRINT : PRINT "look : at text file": PRINT
 64 PRINT "list : text file to printer": PRINT : PRINT "stop : the program"
 68 INPUT "by your command ? "; LINE c$
 70 IF c$="ded" THEN  GO TO 500
 75 IF c$="d" THEN  GO SUB 9000: GO TO 50
 80 IF c$="save" THEN  GO SUB 200: GO TO 50
 82 IF c$="load" THEN  GO SUB 3000: GO TO 50
 85 IF c$="edit" THEN  GO TO 900
 88 IF c$="look" THEN  GO SUB 470: GO TO 50
 90 IF c$="list" THEN  GO SUB 400: GO TO 50
 95 IF c$="stop" THEN  CLS : PRINT AT 11,12;"THE END": STOP
100 CLS : PRINT AT 21,0;"no such command": BEEP 0.2,24: BEEP 0.2,24: PAUSE 100:
GO TO 50
150 GO TO 50
200 CLS : REM save file
210 PRINT "Press q to quit saving": INPUT "enter filename please "; LINE f$
215 IF f$="q" THEN  RETURN
220 IF LEN f$>10 THEN  CLS : PRINT AT 20,0;"filename must be more than 10   cha
racters": BEEP 0.2,24: BEEP 0.2,24: PAUSE 200: GO TO 200
230 IF LEN f$=0 THEN  CLS : PRINT AT 21,0;"no filename specified": BEEP 0.2,24:
BEEP 0.2,24: PAUSE 100: GO TO 200
240 CLS : SAVE f$ DATA T$()
250 PRINT AT 5,4;"file saved": PRINT AT 7,3;"rewind tape for verifying"
260 PRINT AT 21,0; INK 6;"press any key if you are ready"
270 IF INKEY$="" THEN  GO TO 270
280 CLS : PRINT AT 11,10;"start the tape"
290 VERIFY f$ DATA T$()
300 PRINT AT 21,0;"ready, please wait...": PAUSE 300: CLS : GO TO 60
310 RETURN
400 REM list routine
410 CLS : INPUT "list from page? ";f;
420 IF f<1 OR f>8 THEN  PRINT AT 21,0;"It must be between 1 and 8": BEEP 0.2,24
: BEEP 0.2,24: PAUSE 100: CLS : GO TO 410
425 INPUT " to page? ";l
428 IF l<1 OR l>8 THEN  PRINT AT 21,0;"It must be between 1 and 8": BEEP 0.2,24
: BEEP 0.2,24: PAUSE 100: CLS : GO TO 410
430 CLS : LPRINT T$(640*(f-1)+1 TO 640*l)
440 PRINT AT 21,0; INK 6;"Press any key to continue..."
450 IF INKEY$="" THEN  GO TO 450
460 RETURN
470 REM look routine
472 CLS : INPUT "look at page? ";f;
474 IF f<1 OR f>8 THEN  PRINT AT 21,0;"It must be between 1 and 8": BEEP 0.2,24
: BEEP 0.2,24: PAUSE 100: CLS : GO TO 410
476 INPUT " to page? ";l
```


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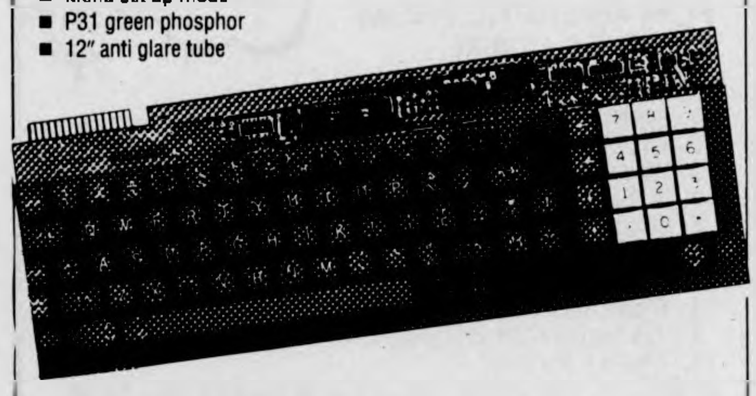

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PROGRAMS

```
 478 IF 1<1 OR 1>8 THEN  PRINT AT 21,0;"It must be between 1 and 8": BEEP 0.2,24
: BEEP 0.2,24: PAUSE 100: CLS : GO TO 410
 480 CLS : PRINT T$(640*(f-1)+1 TO 640*1)
 482 PRINT AT 21,0; INK 6;"Press any key to continue..."
 485 IF INKEY$="" THEN  GO TO 450
 490 RETURN
 500 CLS : DIM T$(5120): LET page=1: REM ded routine
 510 LET row=0: LET col=0
 520 PRINT AT 21,0; INK 6;"page ";page
 530 PRINT AT row,col; FLASH 1;" ";: LET cur=row*32+(640*(page-1)+col+1)
 540 IF INKEY$<>"" THEN  GO TO 540
 550 LET n$=INKEY$: IF n$="" THEN  GO TO 550
 555 BEEP .01,0: PRINT AT 21,10;"
 560 IF CODE n$>=32 AND CODE n$<=127 THEN  GO TO 1300
 570 IF CODE n$=13 THEN  GO TO 1400
 590 IF CODE n$=12 THEN  GO TO 1000
 600 IF CODE n$=8 THEN  GO TO 1500
 610 IF CODE n$=9 THEN  GO TO 1600
 620 IF CODE n$=11 THEN  GO TO 1700
 630 IF CODE n$=10 THEN  GO TO 1800
 640 IF CODE n$=172 THEN  GO TO 2000
 650 IF CODE INKEY$=7 THEN  PRINT AT row,col;" ": GO TO 800
 700 GO TO 520
 800 REM secondary command
 810 INPUT "> "; LINE C$
 820 IF C$="ok" THEN  GO TO 50
 830 IF C$="top" THEN  LET row=0: LET cur=32*row+(640*(page-1)+col+1): PRINT AT
row,col+1;T$(cur TO pagend-1): GO TO 520
 840 IF C$="bop" THEN  CLS : LET row=19: LET newcur=32*row+(640*(page-1)+col+1):
 PRINT AT 0,0;T$(640*(page-1)+1 TO newcur-1): LET cur=newcur: PRINT AT row,col+1
;T$(cur TO pagend-1): GO TO 520
 850 IF C$="bol" THEN  LET col=0: LET cur=32*row+(640*(page-1)+1): PRINT AT row,
1;T$(cur TO cur+30): GO TO 520
 860 IF C$="eol" THEN  LET col=31: LET cur=row*32+(640*(page-1)+col+1): LET t=ro
w*32+(640*(page-1)+1): PRINT AT row,0;T$(t TO t+30): GO TO 890
 870 IF C$="nc" THEN  GO TO 520
 880 PRINT AT 21,10; INK 6;"<<no such command>>": BEEP 0.2,24: BEEP 0.2,24: GO T
O 800
 895 GO TO 520
 900 REM edit routine
 910 CLS : INPUT "which page? ";p
 920 PRINT AT 0,1;T$(640*(p-1)+1 TO 640*p)
 930 LET page=p: LET pagend=640*page
 940 GO TO 510
1000 REM delete routine
1010 IF row=0 AND col=0 THEN  PRINT AT 21,10; INK 6;"<<begining of page>>": BEEP
 0.2,24: BEEP 0.2,24: GO TO 520
1020 IF col=0 THEN  LET T$(cur-1)=" ": PRINT AT row,col;" ": LET row=row-1: LET
col=31: GO TO 520
1030 LET T$(cur-1 TO cur+31-col)=T$(cur TO cur+31-col): PRINT AT row,col;T$(cur-
1 TO cur+31-col): LET col=col-1
1040 GO TO 520
1300 REM add characters
1310 IF page=8 THEN  IF row=19 AND col=31 THEN  PRINT AT 21,10; INK 6;"<<end of
file>>": BEEP 0.2,24: BEEP 0.2,24: GO TO 520
1315 IF row=19 AND col=31 THEN  CLS : LET row=0: LET col=1: PRINT AT 0,0;n$: LET
 T$(cur+1)=n$: LET page=page+1: LET pagend=640*page: GO TO 520
1320 IF T$(cur)<>" " AND T$(cur+31-col)<>" " THEN  BEEP 0.2,24: GO TO 520
1325 IF T$(cur)<>" " AND T$(cur+31-col)=" " THEN  LET T$(cur+1 TO cur+31-col)=T$
(cur TO cur+31-col): LET T$(cur)=n$: PRINT AT row,col;" ": PRINT AT row,col;n$:
LET col=col+1: PRINT AT row,col+1;T$(cur+1 TO cur+31-col): GO TO 520
1330 IF col=31 THEN  PRINT AT row,col;" ": PRINT AT row,col;n$: LET T$(cur)=n$:
LET row=row+1: LET col=0: GO TO 520
1340 LET T$(cur)=n$
1350 PRINT AT row,col;" ": PRINT AT row,col;n$: LET col=col+1
1360 GO TO 520
1400 REM newline routine
1410 IF row=19 AND page=8 THEN  PRINT AT 21,10; INK 6;"<<end of file>>": GO TO 5
20
1420 PRINT AT row,col;T$(cur TO cur+31-col)
1430 LET row=row+1: LET col=0: LET cur=row*32+(640*(page-1)+1): PRINT AT row,col
+1;T$(cur TO pagend-1)
1432 IF row=19 THEN  PRINT AT 21,10; INK 6;"<<last line>>"
1435 IF row>19 THEN  LET page=page+1: CLS : LET pagend=640*page: GO TO 510
1440 GO TO 520
1500 REM cursor left routine
1504 IF page=1 THEN  IF row=0 AND col=0 THEN  PRINT AT 21,10: INK 6;"<<top of fi
le>>": BEEP 0.2,24: BEEP 0.2,24: GO TO 520
1505 IF row=0 AND col=0 THEN  PRINT AT 21,10: INK 6;"begining of page": BEEP 0.2
,24: BEEP 0.2,24: GO TO 520
1510 IF col=0 THEN  PRINT AT row,col;T$(cur-1): LET row=row-1: LET col=31: GO TO
 520
1520 PRINT AT row,col;T$(cur-1)
1540 LET col=col-1
1550 GO TO 520
1600 REM cursor right routine
1605 IF page=8 THEN  IF row=19 AND col=31 THEN  PRINT AT 21,10; INK 6;"<<end of
file>>": BEEP 0.2,24: BEEP 0.2,24: GO TO 520
1610 IF row=19 AND col=31 THEN  PRINT AT 21,10;"<<end of page>>": BEEP 0.2,24: B
EEP 0.2,24: GO TO 520
1620 IF col=31 THEN  PRINT AT row,col;T$(cur): LET row=row+1: LET col=0: GO TO 5
20
1630 PRINT AT row,col;T$(cur): LET col=col+1
1650 GO TO 520
1700 REM cursor up routine
1710 IF page=1 AND row=0 THEN  PRINT AT 21,10; INK 6;"<<top of file>>": BEEP 0.2
,24: BEEP 0.2,24: GO TO 520
1720 IF row=0 AND col=31 THEN  CLS : LET page=page-1: LET pagend=640*page: LET r
ow=19: LET cur=row*32+(640*(page-1)+col+1): PRINT AT 0,0;T$(640*(page-1)+1 TO cu
r-1): GO TO 520
1730 IF row=0 THEN  CLS : LET page=page-1: LET pagend=640*page: LET row=19: LET
cur=row*32+(640*(page-1)+col+1): PRINT AT 0,0;T$(640*(page-1)+1 TO cur-1): PRINT
 AT row,col+1;T$(cur TO pagend-1): GO TO 520
1740 IF col=31 THEN  LET row=row-1: LET cur=32*row+(640*(page-1)+col+1): PRINT A
T row+1,0;T$(cur TO pagend-1): GO TO 520
1750 LET row=row-1: LET cur=32*row+(640*(page-1)+1+col): PRINT AT row,col+1;T$(c
ur TO pagend-1)
1770 GO TO 520
1800 REM cursor down routine
1810 IF page=8 AND row=19 THEN  PRINT AT 21,10; INK 6;"<<end of file>>": BEEP 0.
2,24: BEEP 0.2,24: GO TO 520
1820 IF row=19 AND col=31 THEN  CLS : LET page=page+1: LET pagend=640*page: LET
row=0: LET cur=row*32+(640*(page-1)+col+1): PRINT AT 0,0;T$(640*(page-1)+1 TO cu
r-1): PRINT AT row+1,col;T$(cur TO pagend-1): GO TO 520
1830 IF row=19 THEN  CLS : LET page=page+1: LET pagend=640*page: LET row=0: LET
cur=row*32+(640*(page-1)+col+1): PRINT AT 0,0;T$(640*(page-1)+1 TO cur-1): PRINT
 AT row,col+1;T$(cur TO pagend-1): GO TO 520
1840 IF col=31 THEN  PRINT AT row,col;T$(cur): LET row=row+1: PRINT AT row,0;T$(
cur+1 TO cur+31): LET cur=32*row+(640*(page-1)+col+1): PRINT AT row+1,0;T$(cur T
O pagend-1): GO TO 520
1850 PRINT AT row,col;T$(cur TO cur+31): LET row=row+1: LET cur=32*row+(640*(pag
e-1)+col+1): PRINT AT row,col+1;T$(cur TO pagend-1)
1870 GO TO 520
2000 REM tab routine
```

```
2010 IF col<=26 THEN  PRINT AT row,col;T$(cur TO cur+3): LET col=col+4: PRINT AT
 row,col+1;T$(cur+4 TO cur+4+31-col)
2040 GO TO 520
3000 REM Load text routine
3010 CLS : PRINT "Press q to return to menu."
3020 INPUT "Enter filename please "; LINE f$
3030 IF f$="q" THEN  RETURN
3040 IF f$="" THEN  PRINT AT 20,0;"I will load the first file that I find."
3050 PRINT AT 10,0;"Start the tape."
3060 LOAD f$ DATA T$()
3070 BEEP .1,0: CLS : PRINT AT 10,0;"Stop the tape. "
3080 PAUSE 300: RETURN
9000 REM description
9010 CLS : PRINT "Before using this word processor, there are several commands y
ou must know. eg."
9020 PRINT : PRINT "ded : clears the file": PRINT AT 5,6;"and allows you to": PR
INT AT 6,6;"enter and edit new text"
9030 PRINT : PRINT "save: saves text onto tape"
9040 PRINT : PRINT "list: produces a listing on": PRINT AT 11,6;"printer"
9045 PRINT : PRINT "look: looks at written text": PRINT : PRINT "edit: edits the
 written text": PRINT
9048 PRINT "stop: stops the program": PRINT
9050 PRINT "These are the commands availablebefore entering word processor."
9070 PRINT AT 21,0; INK 6;"Press any key for next page..."
9080 IF INKEY$="" THEN  GO TO 9080
9090 CLS : PRINT "While you are in ded or edit    mode you can do several things
": PRINT
9100 PRINT "Press CAP-SHIFT 1 gives you a prompt '>'. ";
9110 PRINT "You then can  perform the following command. "
9160 PRINT : PRINT "top : cursor to top of page"
9170 PRINT : PRINT "bop : cursor to bottom of page"
9172 PRINT : PRINT "bol : cursor to begining of line"
9175 PRINT : PRINT "eol : cursor to end of line"
9178 PRINT : PRINT "nc  : no change"
9180 PRINT : PRINT "ok  : gets you out of word proc-      essor"
9182 PRINT AT 21,0; INK 6;"Press any key for next page"
9184 IF INKEY$="" THEN  GO TO 9184
9185 CLS : PRINT : PRINT "press CAP-SHIFT 5,6,7,8 : moves cursor as indicated by
 the arrow"
9186 PRINT : PRINT "press SYMBOL-SHIFT i puts cursor four spaces forward"
9190 PRINT AT 21,0; INK 6;"Press any key to continue"
9200 IF INKEY$="" THEN  GO TO 9200
9210 RETURN
```

MZ-80K Graphics Kit

by Daniel Freeman

'Graphics Kit' is a collection of seven useful graphics routines for the Sharp MZ-80K.

The program below sets up the routines at the top of memory. After RUNning, the Basic program is no longer required and may be deleted. Lines 410 onwards contain a demonstration of the way in which the routines are used. To call the routines, values must be POKEd into memory followed by a USR call.

The memory locations you need to know are:

SAVE a screen — POKE 53089,0
RECALL screen — POKE 53089,235 followed, in both cases, by USR (53075).
EXPLOSION effect (works by rotating the characters on the screen through the character set — quite effective) — USR (53120).
SCROLL left — POKE 53156,62
ROTATE left — POKE 53156,26 followed, in both cases, by USR (53144).
SCROLL right — POKE 53156,62
ROTATE right — POKE 53182,26 followed, in both cases, by USR (53170).
SCROLL down — POKE 53203,62
ROTATE down — POKE 53203,126 followed, in both cases, by USR (53196).
SCROLL up — POKE 53229,62
ROTATE up — POKE 53229,126 followed, in both cases, by USR (53222).

To save a screen to tape, execute a LIMIT statement at the beginning of your program. This should take the form LIMIT (53074-1000*n), where n is the number of screens you intend to save. To save a screen, use the statement LET A=53075−1000*s where s is the screen you wish to save. Then execute the following:

POKE 53081,A-INT(A/256)*256
POKE 53082,INT(A/256)
POKE 53089,0
USR (53075)

To load picture s:

LET A=53075−1000*n
POKE 53081,A-INT(A/256)*256
POKE 53082,INT(A/256)
POKE 53089,235
USR (53075)

To fill the screen with a specified character, clear the screen then:

POKE 53108,0
POKE 53112,<ASCII code of character>
USR (53098)

```
10 PRINT"@"
20 REM
30 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
40 REM ▒ SHARP TOOLKIT DEMONSTRATION ▒
50 REM ▒     BY DANIEL FREEMAN       ▒
60 REM ▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒
70 REM
80 LIMIT 43074
90 FOR I=53075 TO 53247
100 READ A:POKE I,A
110 NEXT I
120 GOTO 400
130 REM ---- SAVE/RECALL SCREEN ------
140 DATA 62,0,50,163,232,17,107,203,33
150 DATA 0,208,1,232,3,0,237,176,62,1
160 DATA 50,163,232,201
```


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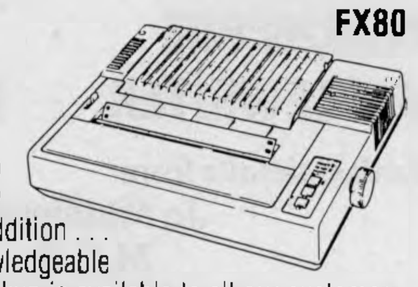

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PROGRAMS

```
170 REM ---- SEARCH/REPLACE CHR. -----
180 DATA 33,0,208,6,25,197,6,40,126
190 DATA 254,0,32,2,54,0,35,16,246,193
200 DATA 16,240,201
210 REM ---- EXPLOSION EFFECT --------
220 DATA 6,0,33,0,208,197,6,25,197,6
230 DATA 40,126,60,119,35,16,250,193
240 DATA 16,244,193,16,235,201
250 REM ---- ROTATE/SCROLL LEFT ------
260 DATA 17,0,208,33,1,208,6,25,197,1
270 DATA 39,0,26,0,237,176,18,35,19
280 DATA 193,16,242,201,0,0,0
290 REM ---- ROTATE/SCROLL RIGHT ----
300 DATA 17,231,211,33,230,211,6,25
310 DATA 197,1,39,0,26,0,237,184,18,43
320 DATA 27,193,16,242,201,0,0,0
330 REM ---- ROTATE/SCROLL DOWN -----
340 DATA 17,231,211,213,225,6,40,126,0
350 DATA 245,43,16,250,1,192,3,237,184
360 DATA 6,40,35,241,119,16,251,201
370 REM ---- ROTATE/SCROLL UP -------
380 DATA 17,0,208,213,225,6,40,126,0
390 DATA 245,35,16,250,1,192,3,237,176
400 DATA 6,40,43,241,119,16,251,201
410 INPUT N:PRINT"■"
420 FOR X=1 TO 10
430 LET Y=X/6.3/N
440 FOR Z=6.3/N TO 6.3 STEP 6.3/N
450 LET P=40:Q=0
460 LET I=40+(30*SIN(Z+X))
470 LET J=25+(15*COS(Z+X))
480 GOSUB 690
490 LET P=40+(30*SIN(Z+X+6.3/N))
500 LET Q=25+(15*COS(Z+X+6.3/N))
510 GOSUB 690
520 NEXT Z
530 LET D=53075-X*1000
540 POKE 53081,D-INT(D/256)*256
550 POKE 53082,INT(D/256)
560 POKE 53089,0
570 USR(53075)
580 PRINT"■"
590 NEXT X
600 POKE 53089,235
610 FOR X=1 TO 10
620 LET D=53075-X*1000
630 POKE 53081,D-INT(D/256)*256
640 POKE 53082,INT(D/256)
650 USR(53075)
660 NEXT X
670 RUN 610
680 STOP
690 LET A=SQR((P-I)*(P-I)+(Q-J)*(Q-J))
700 FOR D=1 TO INT(A)
710 SET P-(P-I)*D/A,Q-(Q-J)*D/A
720 NEXT D
730 RETURN
```

VIC-20 Deathwall
by N Shevill

'Deathwall' is a colourful two-player game for an unexpanded VIC 20. It requires a joystick.

The program is based on the 'light cycle' race in the science-fantasy film *Tron*. The object of the game, as in the film, is for both players to guide their cycles around the grid, one using a joystick, the other the keyboard. Each time either player crosses a trail or hits a wall, a point is awarded to the opposing player. The first player to score nine points is the winner. There are five skill levels.

```
10 S1=0 S2=0 GOSUB300
20 GOSUB550
30 POKEN0-135 POKE36876,135
40 POKE198,0 P1=PEEK(197)
50 D3=D2
60 POKE37139,0 POKE37154,127 J1=PEEK(37137) J2=PEEK(37152) POKE37139,128 POKE3
54,255
70 D2=22*((J1AND4)=0)+((J1AND16)=0)-22*((J1AND8)=0)-((J2AND128)=0)
80 IFD2=23THEND2=22
90 IFD2=-23THEND2=-22
100 IFD2=-21THEND2=-1
110 IFD2=21THEND2=1
120 IFD2=0THEND2=D3
130 IFP1=9THEND1=-22:GOTO170
140 IFP1=33THEND1=22:GOTO170
150 IFP1=17THEND1=-1:GOTO170
160 IFP1=41THEND1=1
170 FORX=0TO(50-SK):NEXTX:POKEN0,150:POKE36876,150:FORX=0TO(50-SK):NEXTX
180 POKEB1,102:POKEB2,102
190 B1=B1+D1:B2=B2+D2:IFPEEK(B1)=102ORPEEK(B1)=160THENS2=S2+1:C1=1:GOTO220
200 IFPEEK(B2)=102ORPEEK(B2)=160THENS1=S1+1:C2=1:GOTO220
210 POKEB1,160:POKEB1+CO,5:POKEB2,160:POKEB2+CO,2:GOTO30
220 POKEN0,0:POKE36876,0:POKEB1,160:POKEB2,160
230 POKEN0,220:FORL=15TO0STEP-1:POKEVO,L:FORM=1TO100
240 IFC1=1THENFORM=0TO4:POKEB1,32:FORI=0TO19:NEXTI:POKEB1,160:NEXTM,L
250 IFC2=1THENFORM=0TO4:POKEB2,32:FORI=0TO19:NEXTI:POKEB2,160:NEXTM,L
260 POKEN0,0:POKEVO,0
270 PRINT"■■■■■■■■■■■■■■■SCORE:":PRINT"■■■■■■■■PLAYER1:■■";S1:PRINT"■■■■■■■■PLAYE
R2:■■";S2
280 IFS1>8ORS2>8THEN620
290 FORX=0TO2000:NEXTX:GOTO20
300 REM*INSTRUCTIONS*
310 POKE36879,8:PRINT"■■■■■■■■■DEATH-WALL"
320 PRINT"■■■■THE WINNER IS THE 1ST PLAYER TO MAKE THEY'REOPPONENT CRASH 9 TIMES
"
330 C$="■■■■■■■■■■■■"
340 LETI$="THE OBJECT OF THE GAME IS TO GUIDE YOUR LIGHT-CYCLE "
350 I$=I$+"AROUND THE GRID WITH THE INTENTION OF FORCING YOUR OPPONENT TO CRASH
"
```

PROGRAMS

```
360 I$=I$+"INTO EITHER OF THE TRAILS LEFT BY THE CYCLES,OR THE WALLS,WHILE ALSO
"
370 I$=I$+"AVOIDING THEM YOURSELF.....
380 PRINTC$;"■■■■■■■■■■CONTROLS:-"
390 PRINT"■■■PLAYER 1■■■■■PLAYER 2■"
400 PRINT"■■■■■■■"
410 PRINT"■■■■■■■■■■
```

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PROGRAMS

```
1040 GOSUB 3000
1050 RETURN
2000 REM FILL
2010 PLOT 11+X,4+Y,17
2020 V=PEEK(O+Y):M=INT(2^(5-X))
2030 POKE O+Y,V OR M
2035 GOSUB 3000
2040 RETURN
3000 REM PLOT VALUES
3010 PLOT 25,4+Y,RIGHT$("    "+STR$(PEEK(O+Y)),4)
3020 PLOT  3,4+Y,RIGHT$("    "+HEX$(PEEK(O+Y)),4)
3030 G=PEEK(O+Y):IF G<32 THEN G=G+64
3040 PLOT 10+Y,12,G
3050 RETURN
8000 TEXT:CLS
8010 PAPER1:INK3:POKE£26A,3
8020 PRINTCHR$(4)
8030 PRINT" "CHR$(27)"J   CHARACTER GENERATOR"CHR$(4)
8035 PRINT:PRINT
8040 PRINT"  "CHR$(96)" PAUL SHIRLEY 21/4/83"
8045 PRINT" RUNS IN 2.1K"
8050 PRINT:PRINT" To select the character to change"
8060 PRINT" type it or it's ASCII code to the    prompt."
8070 PRINT" eg.  '+' or 43 is the same."
8080 PRINT:PRINT" To move the cursor use the arrow     keys."
8090 PRINT:PRINT" Use 'F' to fill a cell 'space' to    clear a cell."
8100 PRINT:PRINT" The left column is hex,the right     decimal."
8110 PRINT" Use the routine at line 9000 to use  the character string (bottom
)."
8120 PRINT" Escape will return to this screen."
8190 PRINTCHR$(20);
8200 INPUT"WHICH CHARACTER ";Z$
8210 IF Z$="" THEN Z$=" "
8220 PRINTCHR$(20);
8230 RETURN
9000 REM ACCEPTS A 9 CHARACTER STRING
9010 REM FIRST CHAR IS CHAR TO DEFINE
9020 REM NEXT EIGHT ARE BOTTOM ROW
9030 REM OF CHAR GEN DISPLAY
9035 REM STRING USED = D$
9040 O=46080+ASC(D$)*8
9050 FOR L=2 TO 9
9060 POKE O+L-2,ASC(MID$(D$,L))
9070 NEXT
9080 RETURN
9100 REM EXAMPLE
9110 D$="^L^???LLX":GOSUB9000
9120 PRINT"^^^^^^^"
```

Oric Cassette Indexer

by C Hamilton

'Cassette Indexer' is a slightly more sophisticated version of the BBC program, this time on an Oric Atmos. Incidentally, both programs were received on the same day — one from Manchester, the other from Belfast.

This program also produces a file list on a tape, giving filename, start and end addresses, baud rate, type of file (Basic program or machine code) and whether or not it was auto saved.

Since the Oric can only read tapes at one baud rate at a time, it is necessary to run the tape through twice if it contains mixed baud rates. RUN the program once, rewind the tape, press the reset button underneath the Oric and play the tape again.

To save the program to tape, type it in and RUN it. Then CSAVE "DIRECTORY",A#7000,E#721F,AUTO.

The author points out that the Oric cassette handling system begins by writing a reference signal header of 16 consecutive #16s, followed by a #24. If one of your files happens to contain this pattern, then the program will be fooled into thinking that it has found a new file. This is, however, the only situation where the program does not work.

```
 1 REM ** M/C Loader **
 5 GRAB : HIMEM #6FFF
10 AA = #7000 : L = 100 : A = AA
15 READ D$ : IF D$ = "END" THEN END
20 REPEAT
25 : READ CS
30 : FOR I = 1 TO LEN(D$) STEP 2
35 :   D = VAL("#"+MID$(D$,I,2))
40 :   POKE A,D : A = A+1
45 :   CS = CS-D
50 : NEXT
55 : IF CS <> 0 THEN 90
60 : L = L+1 : READ D$
65 UNTIL D$ = "END"
70 PRINT : PRINT "No errors." : PRINT
75 DOKE #2F5,AA : PRINT "Located at  "AA"to "A
80 PRINT SPC(11)"("HEX$(AA)" to "HEX$(A)")" : PRINT
85 END
90 PRINT : PRINT "Checksum error in line "L : PRINT
95 END

99 REM ** M/C Data **
100 DATA A975A0708D2C028C2D02A9228D6A02A9,1553
101 DATA 10A0078D6B028C6C022098F8A9008567,1520
102 DATA A940A07120EDCBA984A07120EDCBA9AF,2368
103 DATA A07120EDCBA2282065E5A567F007A9FA,2243
104 DATA A0714C4970A9D8A0712076E520CAE620,2067
105 DATA 96E62030E6C924D0F9A2092030E6955D,2107
106 DATA CAD0F82030E6F0059535E8D0F6953520,2335
107 DATA 987038B0DAA567F018A930A0F48D2C02,2054
```

```
108 DATA 8C2D02A2282065E5209FCB2004E84C03,1492
109 DATA C0A90185674C3870A228A9209DFF03CA,1862
110 DATA D0FAA2008E2804B535F0069D0004E8D0,1887
111 DATA F6A213A05F200571A218A0612005 71A2,1587
112 DATA 1EA467B9F8709D0004A220A464F002A0,1863
113 DATA 04B9FA709D0004C8E8E023D0F4A563F0,2359
114 DATA 0FE8A000B901719D0004E8C8C004D0F4,1947
115 DATA A900A00420EDCB6046534241532O4D45,1446
116 DATA 4D4155544FB90000853 4B90100201271,1109
117 DATA A534853329F04A4A4A4AA8B92F719D00,1648
118 DATA 04E8A533290FA8B92F719D0004E86030,1558
119 DATA 313233343536373839414243444546 00,882
120 DATA 0A20202020202020201B424F5249432D,705
121 DATA 3120544150452044952454354 4F5259,1104
122 DATA 0D0A20202020202020201B426020432E,613
123 DATA 48616D696C746F6E2032303A30313A38,1227
124 DATA 340D0A000A1B4628507265737320524 5,930
125 DATA 5345542074 6F20636816E6765207370,1400
126 DATA 65656420616E642073746F70290A000D,1191
127 DATA 0A46696C65206E616D65202020202020,1035
128 DATA 2020202053747274 20466E7368202020,1084
129 DATA 205479700A0D0A005365617263686 96E,1195
130 DATA 6720666F72014641535407736176656 4,1303
131 DATA 2066696C6573202E2E00536561726368,1285
132 DATA 696E6720666F7204534C4F5707736176,1343
133 DATA 6564206669 6C6573202E2E0095555555,1228
134 DATA END
```


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BBC Cassette Indexer

by Martin Ross

'Cassette Indexer' is a useful utility for a cassette-based Beeb. A printer is required.

Most of us have experienced the problem of having dozens of tapes around, marked with illegible scrawl written at 3am. Sitting in front of your Beeb while it *CATalogues a tape at 1200 baud is a decidedly mind-numbing activity. Hence this program.

To use Cassette Indexer simply RUN the program, insert a tape in your cassette-player, leave the printer online and leave the computer to sort itself out. When you come back 30 or 45 minutes later, you'll find a neatly printed tape catalogue waiting in the printer. It still takes just as long, but at least you only have to insert another tape every half hour or so.

Incidentally — no prizes, but see if you can work out how the program knows when it has come to the end of a file. Definitely falls into the 'crude but effective' category of programming tricks!

```
)LISYT
   10 MODE7
   20 ON ERROR GOTO240
   30 VDU23;8202;0;0;0;
   40 *OPT1,1
   50 *OPT2,0
   60 *OPT3,1
   70 PRINT'CHR$141" Automatic Cassette Indexing Program "'CHR$1
41" Automatic Cassette Indexing Program "
   80 PRINTTAB(0,11)CHR$157CHR$132TAB(0,12)CHR$157TAB(0,13)CHR$1
57
   90 PRINT''"  Rewind cassette to start, check that  printer is
 on-line, press PLAY on tape  recorder, and go and walk the dog
!"TAB(5,23)"Martin Ross - 26.1.84"
   95 REM *** PROGRAM ***
  110 REPEAT
  120   VDU15,28,6,13,39,11
  130   R=OPENIN""
  140   A=BGET#R
  150   CLOSE#R
  160   VDU26
  170   IF ?&7DCF=32 GOTO 120
  180   FOR I%=&7DBD TO &7DCF
  190     B$=B$+CHR$(?I%)
  200     NEXT
  210   VDU2:PRINTB$:VDU3
  220   B$=""
  230   UNTIL FALSE
  235 REM **** END ****
  240 MODE7
  250 PRINT''''''"Thank you and goodnight"
  260 END
```

PET 3D O'S & X'S

by Roger Colley

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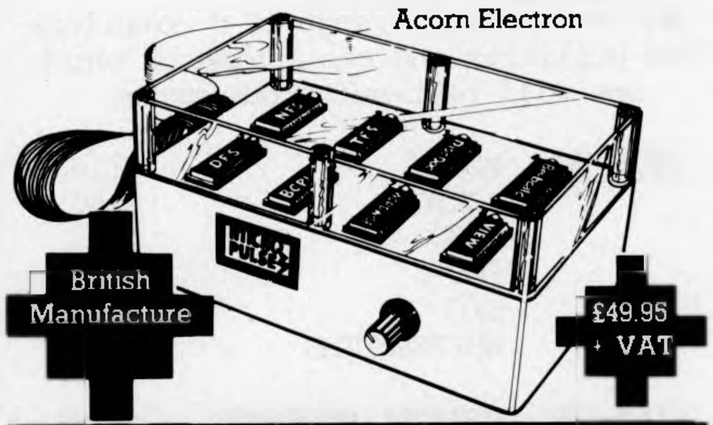

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PROGRAMS

playing against the computer. It runs on an 8000 series PET, but can probably be adapted to other PETs.

We don't usually publish programs of this length, but the PET does tend to get forgotten so . . . PET owners will be kept pretty busy for a few weeks! The winner is the first one to score a line of five in any direction. Crosses are placed by entering the coordinate, letter then number (for example, A3). The author reports that while the program has been beaten when the human starts the game, no-one has yet beaten it when the computer goes first.

```
READY.

 2 REM: THREE DIMENSIONAL NOUGHTS & CROSSES BY ROGER COLLEY 1983
 3 REM: FOR CORRECT DISPLAY PRINT STATEMENTS MUST BE ENTERED ACCURATELY
 4 REM: INCLUDING CURSOR CONTROLS AND SPACES. THE ORDERING OF LINES
 5 REM: 1800-3495 IS VITAL FOR OPTIMUM PLAY BY COMPUTER.
 6 PRINT"■"
 10 PRINTCHR$(142)
 15 GOSUB12000
 20 GOSUB9000
 90 PRINT"■■■WHERE WOULD YOU LIKE TO PLACE YOUR CROSS":GOTO97
 95 PRINT"■■■■■   WHERE WOULD YOU LIKE YOUR NEXT CROSS      "
 96 PRINT"■■■■■                                                "
 97 PRINT"■YOUR SCORE";J4;"                                    ";"MY SCORE";K4
 98 M=1
 99 REM: CROSS INSERTION SEQUENCE
 100 INPUTX$
 105 PRINTCHR$(7)
 110 IF X$="A1" THEN A1=1:POKE33255,214
 120 IF X$="A2" THEN A2=1:POKE33095,214
 130 IFX$="A3" THEN A3=1:POKE32855,214
 140 IFX$="B1" THEN B1=1:POKE33260,214
 150 IFX$="B2" THEN B2=1:POKE33100,214
 160 IFX$="B3" THEN B3=1:POKE32860,214
 170 IFX$="C1" THEN C1=1:POKE33264,214
 180 IFX$="C2" THEN C2=1:POKE33104,214
 190 IFX$="C3" THEN C3=1:POKE32864,214
 200 IFX$="A4" THEN A4=1:POKE33283,214
 210 IFX$="A5" THEN A5=1:POKE33123,214
 220 IFX$="A6" THEN A6=1:POKE32883,214
 230 IFX$="B4" THEN B4=1:POKE33287,214
 240 IFX$="B5" THEN B5=1:POKE33127,214
 250 IFX$="B6" THEN B6=1:POKE32887,214
 260 IFX$="C4" THEN C4=1:POKE33292,214
 270 IFX$="C5" THEN C5=1:POKE33132,214
 280 IFX$="C6" THEN C6=1:POKE32892,214
 290 IFX$="A7" THEN A7=1:POKE33311,214
 300 IFX$="A8" THEN A8=1:POKE33151,214
 310 IFX$="A9" THEN A9=1:POKE32911,214
 320 IFX$="B7" THEN B7=1:POKE33315,214
 330 IFX$="B8" THEN B8=1:POKE33155,214
 340 IFX$="B9" THEN B9=1:POKE32915,214
 350 IFX$="C7" THEN C7=1:POKE33319,214
 360 IFX$="C8" THEN C8=1:POKE33159,214
 370 IFX$="C9" THEN C9=1:POKE32919,214
 480 GOTO 1000
 490 REM: NOUGHT INSERTION SEQUENCE
 500 A1=5 :POKE33255,143:GOTO990
 510 A2=5 :POKE33095,143:GOTO990
 520 A3=5 :POKE32855,143:GOTO990
 530 B1=5 :POKE33260,143:GOTO990
 540 B2=5 :POKE33100,143:GOTO990
 550 B3=5 :POKE32860,143:GOTO990
 560 C1=5 :POKE33264,143:GOTO990
 570 C2=5 :POKE33104,143:GOTO990
 580 C3=5 :POKE32864,143:GOTO990
 590 A4=5 :POKE33283,143:GOTO990
 600 A5=5 :POKE33123,143:GOTO990
 610 A6=5 :POKE32883,143:GOTO990
 620 B4=5 :POKE33287,143:GOTO990
 630 B5=5 :POKE33127,143:GOTO990
 640 B6=5 :POKE32887,143:GOTO990
 650 C4=5 :POKE33292,143:GOTO990
 660 C5=5 :POKE33132,143:GOTO990
 670 C6=5 :POKE32892,143:GOTO990
 680 A7=5 :POKE33311,143:GOTO990
 690 A8=5 :POKE33151,143:GOTO990
 700 A9=5 :POKE32911,143:GOTO990
 710 B7=5 :POKE33315,143:GOTO990
 720 B8=5 :POKE33155,143:GOTO990
 730 B9=5 :POKE32915,143:GOTO990
 740 C7=5 :POKE33319,143:GOTO990
 750 C8=5 :POKE33159,143:GOTO990
 760 C9=5 :POKE32919,143:GOTO990
 990 M=-1
 995 REM:LINE TOTALS & SCORING
 1000 T1=A1+A4+A7:IFT1=3THEND1=1
 1005 IFT1=15THENN1=1
 1010 T2=A2+A5+A8:IFT2=3THEND2=1
 1015 IFT2=15THENN2=1
 1020 T3=A3+A6+A9:IFT3=3THEND3=1
 1025 IFT3=15THENN3=1
 1030 T4=B1+B4+B7:IFT4=3THEND4=1
 1035 IFT4=15THENN4=1
 1040 T5=B2+B5+B8:IFT5=3THEND5=1
 1045 IFT5=15THENN5=1
 1050 T6=B3+B6+B9:IFT6=3THEND6=1
 1055 IFT6=15THENN6=1
 1060 T7=C1+C4+C7:IFT7=3THEND7=1
 1065 IFT7=15THENN7=1
 1070 T8=C2+C5+C8:IFT8=3THEND8=1
 1072 IFT8=15THENN8=1
 1075 T9=C3+C6+C9:IFT9=3THEND9=1
 1077 IFT9=15THENN9=1
 1080 U1 =A1+A2+A3:IFU1 =3THENE1=1
 1085 IFU1=15THEND1=1
 1090 U2 =B1+B2+B3:IFU2 =3THENE2=1
 1095 IFU2=15THEND2=1
 1100 U3 =C1+C2+C3:IFU3 =3THENE3=1
 1105 IFU3=15THEND3=1
 1110 U4 =A4+A5+A6:IFU4 =3THENE4=1
 1115 IFU4=15THEND4=1
 1120 U5 =B4+B5+B6:IFU5 =3THENE5=1
 1125 IFU5=15THEND5=1
 1130 U6 =C4+C5+C6:IFU6 =3THENE6=1
```

PROGRAMS

```
1135 IFU6=15THENO6=1
1140 U7 =A7+A8+A9:IFU7 =3THENE7=1
1145 IFU7=15THENO7=1
1150 U8 =B7+B8+B9:IFU8 =3THENE8=1
1155 IFU8=15THENO8=1
1160 U9 =C7+C8+C9:IFU9 =3THENE9=1
1165 IFU9=15THENO9=1
1170 V1 =A1+B1+C1:IFV1 =3THENF1=1
1175 IFV1=15THENP1=1
1180 V2 =A2+B2+C2:IFV2 =3THENF2=1
1185 IFV2=15THENP2=1
1190 V3 =A3+B3+C3:IFV3 =3THENF3=1
1195 IFV3=15THENP3=1
1200 V4 =A4+B4+C4:IFV4 =3THENF4=1
1205 IFV4=15THENP4=1
1210 V5 =A5+B5+C5:IFV5 =3THENF5=1
1215 IFV5=15THENP5=1
1220 V6 =A6+B6+C6:IFV6 =3THENF6=1
1225 IFV6=15THENP6=1
1230 V7 =A7+B7+C7:IFV7 =3THENF7=1
1235 IFV7=15THENP7=1
1240 V8 =A8+B8+C8:IFV8 =3THENF8=1
1245 IFV8=15THENP8=1
1250 V9 =A9+B9+C9:IFV9 =3THENF9=1
1255 IFV9=15THENP9=1
1260 W1 =A3+B5+C7:IFW1 =3THENG1=1
1265 IFW1=15THENQ1=1
1270 W2 =A1+B5+C9:IFW2 =3THENG2=1
1275 IFW2=15THENQ2=1
1280 W3 =C1+B5+A9:IFW3 =3THENG3=1
1285 IFW3=15THENQ3=1
1290 W4 =C3+B5+A7:IFW4 =3THENG4=1
1295 IFW4=15THENQ4=1
1300 W5 =A1+B2+C3:IFW5 =3THENG5=1
1305 IFW5=15THENQ5=1
1310 W6 =A3+B2+C1:IFW6 =3THENG6=1
1315 IFW6=15THENQ6=1
1320 W7 =A4+B5+C6:IFW7 =3THENG7=1
1325 IFW7=15THENQ7=1
1330 W8 =A6+B5+C4:IFW8 =3THENG8=1
1335 IFW8=15THENQ8=1
1340 W9 =A7+B8+C9:IFW9 =3THENG9=1
1345 IFW9=15THENQ9=1
1350 X1 =A9+B8+C7:IFX1 =3THENH1=1
1355 IFX1=15THENR1=1
1360 X2 =A1+A5+A9:IFX2 =3THENH2=1
1365 IFX2=15THENR2=1
1370 X3 =A3+A5+A7:IFX3 =3THENH3=1
1375 IFX3=15THENR3=1
1380 X4 =B1+B5+B9:IFX4 =3THENH4=1
1385 IFX4=15THENR4=1
1390 X5 =B3+B5+B7:IFX5 =3THENH5=1
1395 IFX5=15THENR5=1
1400 X6 =C1+C5+C9:IFX6 =3THENH6=1
1405 IFX6=15THENR6=1
1410 X7 =C3+C5+C7:IFX7 =3THENH7=1
1415 IFX7=15THENR7=1
1420 X8 =A3+B6+C9:IFX8 =3THENH8=1
1425 IFX8=15THENR8=1
1430 X9 =A9+B6+C3:IFX9 =3THENH9=1
1435 IFX9=15THENR9=1
1440 Y1 =A2+B5+C8:IFY1 =3THENI1=1
1445 IFY1=15THENS1=1
1450 Y2 =A8+B5+C2:IFY2 =3THENI2=1
1455 IFY2=15THENS2=1
1460 Y3 =A1+B4+C7:IFY3 =3THENI3=1
1465 IFY3=15THENS3=1
1470 Y4 =A7+B4+C1:IFY4 =3THENI4=1
1475 IFY4=15THENS4=1
1477 GOSUB7000
1480 IFM=-1THEN95
1485 REM: 'PLAY PRIORITY LOOP
1490 RESTORE
1500 DATA10,2,1
1510 FORI=0TO2
1520 READZ(I)
1790 REM: LINE EXAMINATION SEQUENCE-SELECTS OPTIMUM LINE OF PLAY
1800 IFW1=Z(I)THEN3280
1802 IFW2 =Z(I) THEN3290
1804 IFW3=Z(I) THEN3300
1806 IFW4=Z(I)THEN3310
1810 IFT5=Z(I)THEN3050
1812 IFV5=Z(I)THEN3230
1814 IFU5=Z(I)THEN3140
1816 IFW7=Z(I)THEN3340
1820 IFW8=Z(I)THEN3350
1821 IFX4=Z(I)THEN3400
1823 IFX5=Z(I)THEN3410
1824 IFY1=Z(I)THEN3460
1825 IFY2=Z(I)THEN3470
1826 IFW5=Z(I)THEN3320
1827 IFW6=Z(I)THEN3330
1828 IFW9=Z(I)THEN3360
1829 IFX1=Z(I)THEN3370
1830 IFX2=Z(I)THEN3380
1831 IFX3=Z(I)THEN3390
1832 IFX6=Z(I)THEN3420
1833 IFX7=Z(I)THEN3430
1834 IFX8=Z(I)THEN3440
1835 IFX9=Z(I)THEN3450
1836 IFY3=Z(I)THEN3480
1837 IFY4=Z(I)THEN3490
1838 IFT1=Z(I)THEN3010
1839 IFT3=Z(I)THEN3030
1840 IFT7=Z(I)THEN3070
1842 IFT9=Z(I)THEN3090
1844 IFU1=Z(I)THEN3100
1846 IFU3=Z(I)THEN3120
1850 IFU7=Z(I)THEN3160
1852 IFU9=Z(I)THEN3180
1854 IFV1=Z(I)THEN3190
1856 IFV3=Z(I)THEN3210
1860 IFV7=Z(I)THEN3250
1862 IFV9=Z(I)THEN3270
1864 IFT2=Z(I)THEN3020
1866 IFT4=Z(I)THEN3040
1870 IFT6=Z(I)THEN3060
1872 IFT8=Z(I)THEN3080
1874 IFU2=Z(I)THEN3110
```


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PROGRAMS

```
1876 IFU4=Z(I)THEN3130
1880 IFU6=Z(I)THEN3150
1882 IFU8=Z(I)THEN3170
1884 IFV2=Z(I)THEN3200
1886 IFV4=Z(I)THEN3220
1890 IFV6=Z(I)THEN3240
1892 IFV8=Z(I)THEN3260
1900 NEXTI
3000 REM: PLAY DECISION SEQUENCE-SELECTS OPTIMUM SQUARE
3010 IFA1=0THEN500
3012 IFA7=0THEN680
3015 IFA4=0THEN590
3020 IFA5=0THEN600
3022 IFA8=0THEN690
3025 IFA2=0THEN510
3030 IFA3=0THEN520
3032 IFA9=0THEN700
3035 IFA6=0THEN610
3040 IFB4=0THEN620
3042 IFB7=0THEN710
3045 IFB1=0THEN530
3050 IFB5=0THEN630
3052 IFB8=0THEN720
3055 IFB2=0THEN540
3060 IFB6=0THEN640
3062 IFB9=0THEN730
3065 IFB3=0THEN550
3070 IFC1=0THEN560
3072 IFC7=0THEN740
3075 IFC4=0THEN650
3080 IFC5=0THEN660
3082 IFC8=0THEN750
3085 IFC2=0THEN570
3090 IFC3=0THEN580
3092 IFC9=0THEN760
3095 IFC6=0THEN670
3100 IFA1=0THEN500
3102 IFA3=0THEN520
3105 IFA2=0THEN510
3110 IFB2=0THEN540
3112 IFB3=0THEN550
3115 IFB1=0THEN530
3120 IFC1=0THEN560
3122 IFC3=0THEN580
3125 IFC2=0THEN570
3130 IFA5=0THEN600
3132 IFA6=0THEN610
3135 IFA4=0THEN590
3140 IFB5=0THEN630
3142 IFB6=0THEN640
3145 IFB4=0THEN620
3150 IFC5=0THEN660
3152 IFC6=0THEN670
3155 IFC4=0THEN650
3160 IFA7=0THEN680
3162 IFA9=0THEN700
3165 IFA8=0THEN690
3170 IFB8=0THEN720
3172 IFB9=0THEN730
3175 IFB7=0THEN710
3180 IFC7=0THEN740
3182 IFC9=0THEN760
3185 IFC8=0THEN750
3190 IFA1=0THEN500
3192 IFC1=0THEN560
3195 IFB1=0THEN530
3200 IFB2=0THEN540
3202 IFC2=0THEN570
3205 IFA2=0THEN510
3210 IFA3=0THEN520
3212 IFC3=0THEN580
3215 IFB3=0THEN550
3220 IFB4=0THEN620
3222 IFC4=0THEN650
3225 IFA4=0THEN590
3230 IFB5=0THEN630
3232 IFC5=0THEN660
3235 IFA5=0THEN600
3240 IFB6=0THEN640
3242 IFC6=0THEN670
3245 IFA6=0THEN610
3250 IFA7=0THEN680
3252 IFC7=0THEN740
3255 IFB7=0THEN710
3260 IFB8=0THEN720
3262 IFC8=0THEN750
3265 IFA8=0THEN690
3270 IFA9=0THEN700
3272 IFC9=0THEN760
3275 IFB9=0THEN730
3280 IFB5=0THEN630
3282 IFC7=0THEN740
3285 IFA3=0THEN520
3290 IFB5=0THEN630
3292 IFC9=0THEN760
3295 IFA1=0THEN500
3300 IFB5=0THEN630
3302 IFA9=0THEN700
3305 IFC1=0THEN560
3310 IFB5=0THEN630
3312 IFA7=0THEN680
3315 IFC3=0THEN580
3320 IFA1=0THEN500
3322 IFC3=0THEN580
3325 IFB2=0THEN540
3330 IFA3=0THEN520
3332 IFC1=0THEN560
3335 IFB2=0THEN540
3340 IFB5=0THEN630
3342 IFC6=0THEN670
3345 IFA4=0THEN590
3350 IFB5=0THEN630
3352 IFC4=0THEN650
3355 IFA6=0THEN610
3360 IFA7=0THEN680
3362 IFC9=0THEN760
3365 IFB8=0THEN720
3370 IFA9=0THEN700
```

PROGRAMS

```
3372 IFC7=0THEN740
3375 IFB8=0THEN720
3380 IFA1=0THEN500
3382 IFA9=0THEN700
3385 IFA5=0THEN600
3390 IFA3=0THEN520
3392 IFA7=0THEN680
3395 IFA5=0THEN600
3400 IFB5=0THEN630
3402 IFB9=0THEN730
3405 IFB1=0THEN580
3410 IFB5=0THEN630
3412 IFB7=0THEN710
3415 IFB3=0THEN550
3420 IFC1=0THEN560
3422 IFC9=0THEN760
3425 IFC5=0THEN660
3430 IFC3=0THEN580
3432 IFC7=0THEN740
3435 IFC5=0THEN660
3440 IFA3=0THEN520
3442 IFC9=0THEN760
3445 IFB6=0THEN640
3450 IFA9=0THEN700
3452 IFC3=0THEN580
3455 IFB6=0THEN640
3460 IFB5=0THEN630
3462 IFC8=0THEN750
3465 IFA2=0THEN510
3470 IFB5=0THEN630
3472 IFC2=0THEN570
3475 IFA8=0THEN690
3480 IFA1=0THEN500
3482 IFC7=0THEN740
3485 IFB4=0THEN620
3490 IFA7=0THEN680
3492 IFC1=0THEN560
3495 IFB4=0THEN620
6990 REM: SCORING & WINNING SEQUENCE
7000 J1=D1+D2+D3+D4+D5+D6+D7+D8+D9+E1+E2+E3+E4+E5+E6+E7+E8+E9+F1+F2+F3+F4+F5
7010 J2=F6+F7+F8+F9+G1+G2+G3+G4+G5+G6+G7+G8+G9+H1+H2+H3+H4+H5+H6+H7+H8+H9
7020 J3=I1+I2+I3+I4
7030 J4=J1+J2+J3
7040 K1=N1+N2+N3+N4+N5+N6+N7+N8+N9+O1+O2+O3+O4+O5+O6+O7+O8+O9+P1+P2+P3+P4+P5
7050 K2=P6+P7+P8+P9+Q1+Q2+Q3+Q4+Q5+Q6+Q7+Q8+Q9+R1+R2+R3+R4+R5+R6+R7+R8+R9
7060 K3=S1+S2+S3+S4
7070 K4=K1+K2+K3
7090 PRINT:PRINT
7110 IFJ4>4THEN7500
7120 IFK4>4THEN8000
7130 RETURN
7500 PRINT"■■"
7505 PRINTCHR$(7):CHR$(7);"        " ;"■■R                    YOU WIN
7510 PRINT"■YOUR SCORE  ";J4;"                                ";"MY SCORE";K4
7520 GOTO11000
8000 PRINTCHR$(7);CHR$(7);CHR$(7);"                ";"■■RI WIN"
8005 PRINT"■YOUR SCORE";J4;"                          ";"MY SCORE";K4
8010 GOTO11000
9000 PRINT
9005 REM: DISPLAY SEQUENCE-ENTER ACCURATELY
9010 PRINT"    3";TAB(30);"6";TAB(60);"9"
9020 PRINT"■■    2";TAB(30);"5";TAB(60);"8"
9032 PRINT"■■    1";TAB(30);"4";TAB(60);"7"
9040 PRINT"      A    B    C"
9050 PRINTTAB(35);"■A    B    C"
9060 PRINTTAB(63);"■A    B    C"
9070 PRINT"■         ■FRONT"
9080 PRINTTAB(37)"■■MIDDLE"
9090 PRINTTAB(66)"■■BACK"
10000 POKE32777,93:POKE32782,93:POKE32805,93:POKE32810,93:POKE32833,93
10010 POKE32838,93:POKE32857,93:POKE32862,93:POKE32885,93:POKE32890,93
10020 POKE32913,93:POKE32918,93:POKE32937,91:POKE32942,91:POKE32965,91
10030 POKE32970,91:POKE32993,91:POKE32998,91:POKE33017,93:POKE33022,93
10040 POKE33045,93:POKE33050,93:POKE33073,93:POKE33078,93:POKE33097,93
10050 POKE33102,93:POKE33102,93:POKE33125,93:POKE33130,93:POKE33153,93
10060 POKE33158,93:POKE33177,91:POKE33182,91:POKE33205,91:POKE33210,91
10070 POKE33233,91:POKE33238,91:POKE33257,93:POKE33262,93:POKE33285,93
10080 POKE33290,93:POKE33313,93:POKE33318,93:POKE33337,93:POKE33342,93
10090 POKE33365,93:POKE33370,93:POKE33393,93:POKE33398,93
10100 POKE32933,64:POKE32934,64:POKE32935,64:POKE32936,64:POKE32938,64
10110 POKE32939,64:POKE32940,64:POKE32941,64:POKE32943,64:POKE32944,64
10120 POKE32945,64:POKE32946,64:POKE32961,64:POKE32962,64:POKE32963,64
10130 POKE32964,64:POKE32966,64:POKE32967,64:POKE32968,64:POKE32969,64
10140 POKE32971,64:POKE32972,64:POKE32973,64:POKE32974,64:POKE32989,64
10150 POKE32990,64:POKE32991,64:POKE32992,64:POKE32994,64:POKE32995,64
10160 POKE32996,64:POKE32997,64:POKE32999,64:POKE33000,64:POKE33001,64
10170 POKE33002,64:POKE33173,64:POKE33174,64:POKE33175,64:POKE33176,64
10180 POKE33178,64:POKE33179,64:POKE33180,64:POKE33181,64:POKE33201,64
10190 POKE33202,64:POKE33203,64:POKE33204,64:POKE33206,64:POKE33207,64
10200 POKE33208,64:POKE33209,64:POKE33211,64:POKE33212,64:POKE33213,64
10210 POKE33214,64:POKE33229,64:POKE33230,64:POKE33231,64:POKE33232,64
10220 POKE33234,64:POKE33235,64:POKE33236,64:POKE33237,64:POKE33239,64
10230 POKE33240,64:POKE33241,64:POKE33242,64
10240 POKE33183,64:POKE33184,64:POKE33185,64:POKE33186,64
10250 RETURN
11000 PRINT"ANOTHER GAME? (Y/N)"
11010 INPUT Z$
11020 IFZ$<>"Y"ANDZ$<>"N"THEN11010
11030 IF Z$="Y"THENRUN
11040 STOP
11900 REM: INSTRUCTIONS & OPENING
12000 PRINT"■    THREE DIMENSIONAL NOUGHTS AND CROSSES
12002 PRINT"    ------------------------------------"
12004 PRINT"■■YOU ALWAYS PLAY CROSSES COMPUTER PLAYS NOUGHTS"
12006 PRINT"LINES MAY BE COMPLETED IN ANY DIRECTION AND IN ALL THREE PLANES"
12007 PRINT"THERE ARE 49 POSSIBLE LINES IN TOTAL SOME LINES ARE DIFFICULT"
12008 PRINT"TO SEE SO LOOK CAREFULLY - THE COMPUTER DOES NOT CHEAT"
12009 PRINT"FIRST TO COMPLETE FIVE  LINES WINS- GOOD LUCK"
12010 PRINT"■■■
```

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PROGRAMS

```
 12080 IF Y%=5 THEN 12120
 12085 IF Y%=6 THEN 12140
 12090 B5=5 :POKE33127,143:RETURN
 12100 A1=5 :POKE33255,143:RETURN
 12110 C7=5 :POKE33319,143:RETURN
 12120 B2=5 :POKE33100,143:RETURN
 12130 A5=5 :POKE33123,143:RETURN
 12140 A9=5 :POKE32911,143:RETURN
READY.
```

Basic-86 Marvin

by Chris Blackmore

'Marvin' is an interesting twist of the 'Eliza' kind, running under Basic-86/ Personal Basic. It should be a simple matter to convert it to any similar disk-based Basic.

Eliza is by now well known as a program which holds moderately consistent and rational conversations with the user, acting the role of a reflective counsellor. Marvin works in the same way but has a 'personality' appropriate to a paranoid android.

Marvin differs from most Elizas written in Basic in that it stores its database of keywords and responses as an independent disk file. This enables the same core program to be used with different libraries of responses, and thus for different 'personalities' to be created. But more importantly, the database can be added to and modified by the user while it is running. Put another way, Marvin is capable of 'learning' from experience.

Most Elizas, faced with input which does not match any of their keywords, resort to a non-committal reply — the classics being 'I see' and 'Tell me more'. Marvin, however, is too honest to bluff: when he doesn't understand, he admits it. The program will ask you to identify the keyword in your input and supply it with one or more suitable responses. The program then adds the keyword and response(s) to its database.

The program's ability to learn can be temporarily cancelled by entering 'nolearn'. In 'nolearn' mode, Marvin resorts to the tried and trusted Eliza ploy of a vague response. The word 'onlearn' switches the learning ability back on, and 'unlearn' cancels a learnt response. The phrase 'can it' is a subtle way of communicating to Marvin that you wish to discontinue the conversation.

```
A>1000 REM ************************************************************
1010 REM *                                                          *
1020 REM *    M A R V I N   t h e   P a r a n o i d   A n d r o i d .   *
1030 REM *                                                          *
1040 REM * A program to simulate a conversation with the infamous    *
1050 REM * robot from the Hitch-Hikers Guide to the Galaxy. Unlike the *
1060 REM * more normal Eliza type of program, this one can learn new  *
1070 REM * replies from you. This is popularly known among my friends as *
1080 REM * artificial stupidity! You can safely leave the REMs out when *
1090 REM * you enter the program.                                    *
1100 REM *                                          Chris Blackmore. *
1110 REM ************************************************************
1120 ON ERROR GOTO 5720
1130 REM SET NUMBER OF SCREEN COLUMNS TO USE AND SELECT LEARN MODE
1140 COLS = 79 : LEARN = (1=1)
1150 DIM NEWREPLY$(1)
1160 REM SEE IF THIS IS THE FIRST RUN
1170 OPEN "I", #1, "KEYS.NEW"
1180 GOTO 1360
1190 REM FILES ARE ABSENT, SO THIS IS FIRST RUN. CREATE FILES
1200 REM FIRST CREATE THE KEYWORD FILE
1210 PRINT "First run, please wait while I set up my files..."
1220 NUMREP = 0
1230 OPEN "O", #1, "KEYS.NEW" : RESTORE 4790 : READ NK : PRINT #1, STR$(NK)
1240 FOR I = 1 TO NK
1250 READ K$, L : PRINT #1, K$;",";STR$(L) : NUMREP = NUMREP+L
1260 NEXT I
1270 CLOSE #1
1280 REM NOW SET UP THE REPLY FILE
1290 OPEN "R", #2, "REPLY.NEW" : FIELD #2, 128 AS REPLY$ : RESTORE 4910
1300 FOR I = 1 TO NUMREP
1310 READ R$ : LSET REPLY$ = R$ : PUT #2, I
1320 NEXT I
1330 CLOSE #2
1340 OPEN "I", #1, "KEYS.NEW"
1350 REM SET UP THE MAIN ARRAYS FROM THE DISC FILES
1360 INPUT #1, NK$ : NK = VAL(NK$) : DIM KEY$(NK), A(NK,3)
1370 A(1,1) = 1
1380 FOR I = 1 TO NK : INPUT #1, K$, L$ : KEY$(I) = K$
1390 IF I = 1 THEN 1410
1400 A(I,1) = A(I-1,2)+1
1410 A(I,2) = A(I,1)+VAL(L$)-1
1420 A(I,3) = A(I,1)
1430 NEXT I
1440 CLOSE #1
1450 REM SET UP THE SWAP ARRAY
1460 RESTORE 1480 : DIM SWOP$(16) : NS = 16
1470 FOR I = 1 TO 16 : READ SWOP$(I) : NEXT I
1480 DATA "myself", "yourself", " are ", " am ", "were ", "was ", " you ", " i "
1490 DATA "your ", "my ", " ive", " youve", " im ", " youre ", " me ", " !you "
1500 REM CLEAR SCREEN AND PRINT THE LOGO THEN OPEN REPLY FILE FOR USE
1510 GOSUB 4650 : OPEN "R", #2, "REPLY.NEW"
1520 FIELD #2, 128 AS REPLY$
1530 REM SET UP THE INITIAL MESSAGE
1540 F$ = "even though i have a brain the size of a planet i am willing*"
1550 C$ = " to talk to you if you want me to..."
1560 GOTO 1620
1570 REM START OF MAIN PROGAM LOOP
1580 REM MOVE LAST INPUT FROM I$ TO P$
1590 P$ = I$
1600 REM PRINT THE CONTENTS OF F$. IF IT ENDS IN A "*" THEN ALSO PRINT
1610 REM THE CONTENTS OF C$, THE "TAIL" OF THE INPUT STRING.
1620 GOSUB 2140
1630 REM NOW GET THE USER'S INPUT
1640 GOSUB 2390
1650 REM CHECK TO SEE IF INPUT CONTAINS STOP COMMAND
1660 I = INSTR(I$,"can it") : IF I = 0 THEN 1740
1670 REM EXIT FROM PROGRAM
1680 F$ = "i doubt whether anyone with a brain the size of a planet is*"
```

PROGRAMS

```
1690 C$ = " likely to enjoy being told to do that... goodbye!"
1700 REM PRINT THE ABOVE TWO LINES, THEN THE LOGO WITHOUT SCREEN CLEAR
1710 REM THEN CLOSE THE REPLY FILE AND IT'S ALL OVER!
1720 GOSUB 2140 : GOSUB 4660 : CLOSE #2 : END
1730 REM CHECK TO SEE IF THERE WAS REPEATED INPUT
1740 IF I$ <> P$ THEN 1820
1750 ON INT(RND(1)*5+1) GOTO 1760, 1770, 1780, 1790, 1800
1760 F$ = "please refrain from repeating yourself!" : GOTO 1590
1770 F$ = "i think you will find that you already said that!" : GOTO 1590
1780 F$ = "this conversation is getting repetitive!" : GOTO 1590
1790 F$ = "you already said that!" : GOTO 1590
1800 F$ = "i feel as though i have heard that before..." : GOTO 1590
1810 REM CHECK FOR THE "ONLEARN" COMMAND
1820 I = INSTR(I$,"onlearn") : IF I = 0 THEN 1860
1830 LEARN = (1=1)
1840 F$ = "it is thoughtful of you to let me learn from our conversation." : GOT
O 1590
1850 REM CHECK FOR THE "NOLEARN" COMMAND
1860 I = INSTR(I$,"nolearn") : IF I = 0 THEN 1900
1870 LEARN = (1=2)
1880 F$ = "i have now switched off my ability to learn new replies." : GOTO 1590
1890 REM CHECK FOR "UNLEARN" COMMAND
1900 I = INSTR(I$,"unlearn") : IF I = 0 THEN 1930 ELSE GOSUB 3920
1910 F$ = "now what were we talking about before i forgot that?" : GOTO 1590
1920 REM SCAN INPUT FOR KEYWORDS
1930 GOSUB 2640
1940 REM JUMP IF A KEY WORD WAS FOUND
1950 IF K <> 0 THEN 2040
1960 REM NO KEY WAS FOUND, SO CALL THE LEARNING ROUTINE IF NOT DISABLED
1970 IF LEARN THEN 2000
1980 REM LEARNING IS DISABLED, SO USE A "NOKEYFOUND" ANSWER
1990 K = NK : GOTO 2040
2000 GOSUB 3080
2010 F$ = "can you remember what we were discussing before all*"
2020 C$ = " those complications?" : GOTO 1590
2030 REM A KEY WAS FOUND, SO LOOK UP THE REPLY
2040 GET #2, A(K,3)
2050 F$ = REPLY$
2060 REM DISPOSE OF TRAILING SPACES CAUSED BY FILE PADDING
2070 IF RIGHT$(F$,1) <> " " THEN 2090
2080 F$ = LEFT$(F$,LEN(F$)-1) : GOTO 2070
2090 A(K,3) = A(K,3)+1 : IF A(K,3) > A(K,2) THEN A(K,3) = A(K,1)
2100 REM END OF MAIN PROGRAM LOOP
2110 GOTO 1590
2120 REM SUBROUTINES START HERE
2130 REM AUTOMATIC FORMATTING OUTPUT ROUTINE
2140 IF RIGHT$(F$,1) <> "*" THEN 2160
2150 F$ = LEFT$(F$,LEN(F$)-1)+C$
2160 G = ASC(F$) : IF G > 92 THEN G = G-32
2170 G$ = CHR$(G)+RIGHT$(F$,LEN(F$)-1)
2180 REM DEAL WITH LOWER CASE PERSONAL PRONOUNS
2190 II = INSTR(G$," ive ") : IF II = 0 THEN 2210
2200 G$ = LEFT$(G$,II-1)+" I've "+RIGHT$(G$,LEN(G$)-II-4) : GOTO 2190
2210 II = INSTR(G$," im ") : IF II = 0 THEN 2230
2220 G$ = LEFT$(G$,II-1)+" I'm "+RIGHT$(G$,LEN(G$)-II-3) : GOTO 2210
2230 II = INSTR(G$," i ") : IF II = 0 THEN 2250
2240 G$ = LEFT$(G$,II-1)+" I "+RIGHT$(G$,LEN(G$)-II-2) : GOTO 2230
2250 F$ = RIGHT$(G$,1)
2260 IF F$ = "." OR F$ = "?" OR F$ = "!" THEN 2300
2270 IF F$ = " " THEN G$ = LEFT$(G$,LEN(G$)-1) : GOTO 2250
2280 G$ = G$+" ?"
2290 REM NOW IT IS READY TO BE PRINTED. IS IT TOO LONG FOR A LINE?
2300 IF LEN(G$) > COLS THEN 2330
2310 PRINT G$ : RETURN
2320 REM IF IT IS TOO LONG, FIND A GAP BETWEEN WORDS TO BEAK LINE AT
2330 F$ = LEFT$(G$,COLS) : I = COLS
2340 IF MID$(F$,I,1) = " " THEN 2360
2350 I = I-1 : GOTO 2340
2360 F$ = LEFT$(G$,I) : PRINT F$
2370 G$ = RIGHT$(G$,LEN(G$)-I) : GOTO 2300
2380 REM SUBROUTINE TO GET USER'S INPUT IN STANDARD FORMAT
2390 I$ = " " : II$ = "" : J$ = ""
2400 II$ = INKEY$ : IF LEN(II$) = 0 THEN 2400
2410 REM IF KEY WAS RETURN, JUMP TO END OF ROUTINE
2420 F = ASC(II$) : IF F = 13 THEN 2550
2430 PRINT CHR$(F);
2440 REM ACCEPT SPACES
2450 IF F = 32 THEN 2530
2460 REM DEAL WITH BACKSPACES
2470 IF F = 8 AND LEN(J$) > 1 THEN J$ = LEFT$(J$,LEN(J$)-1) : GOTO 2400
2480 REM IGNORE EVERYTHING THAT ISN'T A LETTER
2490 IF F < 65 OR F > 123 THEN 2400
2500 IF F > 90 AND F < 97 THEN 2400
2510 REM CONVERT ANY UPPER CASE LETTER TO LOWER CASE
2520 IF F < 91 AND F > 64 THEN F = F+32
2530 J$ = J$+CHR$(F) : GOTO 2400
2540 REM NO MORE INPUT TO COME. PUT SPACE ON EACH END
2550 I$ = I$+J$+" " : PRINT
2560 REM DEAL WITH ANY MULTIPLE SPACES
2570 I = INSTR(J$,"  ") : IF I = 0 THEN 2590
2580 J$ = LEFT$(J$,I)+RIGHT$(J$,LEN(J$)-I-1) : GOTO 2570
2590 I$ = J$ : RETURN
2600 REM ROUTINE TO SEARCH FOR KEYWORDS IN THE INPUT
2610 REM THERE ARE AT LEAST TWO WAYS TO DO THIS, THAT I KNOW OF, BOTH OF WHICH
2620 REM HAVE ADVANTAGES AND DISADVANTAGES, SO THE PROGRAM CHOOSES A METHOD AT
2630 REM RANDOM AND PROCEDES ACCORDINGLY!
2640 T = 0 : K = 0 : IF RND(1) > .5 THEN 2800
2650 REM IN EACH POSITION IN I$ IN TURN, LOOK FOR EACH KEY
2660 REM THIS GIVES PRIORITY TO KEYWORDS AT THE BEGINNING OF THE
2670 REM INPUT OVER A KEYWORD FURTHER TO THE RIGHT OF THE INPUT.
2680 FOR I = 1 TO LEN(I$)
2690 IF K > 0 THEN 2750
2700 FOR J = 1 TO NK
2710 IF LEN(KEY$(J)) > LEN(I$)-I+1 THEN 2740
2720 IF MID$(I$,I,LEN(KEY$(J))) <> KEY$(J) THEN 2740
2730 K = J : T = I
2740 NEXT J
2750 NEXT I
2760 GOTO 2870
2770 REM USING KEYS IN TURN, LOOK ALL ALONG LINE WITH EACH
2780 REM THIS GIVES PRIORITY TO KEYWORDS THAT OCCUR EARLIER IN THE LIST
2790 REM OF KEYWORDS OVER THOSE THAT OCCUR LATER IN THE LIST.
2800 FOR I = 1 TO NK
2810 IF K > 0 THEN 2840
2820 J = INSTR(I$,KEY$(I)) : IF J = 0 THEN 2840
2830 K = I : T = J
2840 NEXT I
2850 REM EXTRACT C$ FROM THE END OF I$
2860 REM C$ IS ALL OF I$ AFTER THE KEYWORD THAT HAS BEEN MATCHED
2870 C$ = RIGHT$(I$,LEN(I$)-T-LEN(KEY$(K))+1)+" "
2880 REM ROUTINE TO PROCESS C$ IN CASE IT IS WANTED
2890 REM IT SOMETIMES PUTS "I" WHEN IT MEANS "ME" - NOBODY'S PERFECT
2900 FOR I = 1 TO NS/2
2910 L$ = SWOP$(I+I-1) : M$ = SWOP$(I+I)
2920 FOR J = 1 TO LEN(C$)
2930 IF J+LEN(L$) > LEN(C$) THEN 2980
2940 IF MID$(C$,J,LEN(L$)) <> L$ THEN 2980
2950 C$ = LEFT$(C$,J-1)+M$+RIGHT$(C$,LEN(C$)-J-LEN(L$)+1)
2960 J = J+LEN(M$)
2970 GOTO 3010
2980 IF J+LEN(M$) > LEN(C$) THEN 3010
2990 IF MID$(C$,J,LEN(M$)) <> M$ THEN 3010
3000 C$ = LEFT$(C$,J-1)+L$+RIGHT$(C$,LEN(C$)-J-LEN(M$)+1)
3010 NEXT J
3020 NEXT I
3030 REM REMOVE EXCLAMATION MARKS FROM THE PROCESSED C$
3040 I = INSTR(C$,"!") : IF I = 0 THEN 3060
3050 C$ = LEFT$(C$,I-1)+RIGHT$(C$,LEN(C$)-I-1) : GOTO 3040
3060 RETURN
```


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PROGRAMS

```
3070 REM THE LEARNING ROUTINE, WHICH MAKES MARVIN "INTELLIGENT"
3080 PRINT
3090 F$ = "i was not able to find any keywords that i know in*"
3100 C$ = " your input so i will allow you to extend my files."
3110 GOSUB 2140
3120 REM FIND OUT WHICH PART OF INPUT IS TO BE A NEW KEY
3130 PRINT : PRINT "Your input was:" : PRINT I$
3140 PRINT "Please re-type the keywords:";
3150 LINE INPUT F$
3160 REM CONVERT TO LOWER CASE
3170 NEWKEY$ = ""
3180 FOR I = 1 TO LEN(F$)
3190 F = ASC(MID$(F$,I,1)) : IF F > 64 AND F < 91 THEN F = F+32
3200 NEWKEY$ = NEWKEY$+CHR$(F)
3210 NEXT I
3220 REM CHECK FOR EXCESSIVE INPUT
3230 IF LEN(NEWKEY$) <= LEN(I$) THEN 3260
3240 PRINT "Much too long to be right! Please try again..." : GOTO 3130
3250 REM CHECK FOR INPUT NOT INCLUDED IN ORIGINAL INPUT
3260 I = INSTR(I$,NEWKEY$) : IF I <> 0 THEN 3280
3270 PRINT "I can not find that in the input. Have another try..." : GOTO 3130
3280 PRINT : PRINT "The new key is '";NEWKEY$;"'."
3290 REM FIND OUT HOW MANY REPLIES THERE WILL BE
3300 PRINT "How many replies will it have?"
3310 LINE INPUT F$
3320 NUMREP = INT(VAL(F$)) : IF NUMREP > 0 AND NUMREP < 10 THEN 3350
3330 PRINT "Please enter a number from 1 to 9." : GOTO 3280
3340 REM SET UP AN ARRAY TO ACCEPT THE REPLIES
3350 ERASE NEWREPLY$ : DIM NEWREPLY$(NUMREP)
3360 REM NOW GET THE REPLIES
3370 PRINT : PRINT "Now type in the";NUMREP;" replies."
3380 FOR I = 1 TO NUMREP
3390 LINE INPUT NEWREPLY$(I)
3400 REM CHECK THEY WILL FIT IN THE REPLY FILE
3410 IF LEN(NEWREPLY$(I)) < 128 THEN 3430
3420 PRINT "That is too long. Please use less than 128 characters." : GOTO 3390
3430 FOR J = 1 TO LEN(NEWREPLY$(I))
3440 REM CONVERT TO LOWER CASE WHERE NECESSARY
3450 F = ASC(MID$(NEWREPLY$(I),J,1))
3460 IF F > 64 AND F < 91 THEN MID$(NEWREPLY$(I),J,1) = CHR$(F+32)
3470 NEXT J
3480 NEXT I
3490 REM CHECK TO SEE IF IT WAS ALL CORRECT
3500 PRINT : PRINT "The ";NUMREP;"replies for '";NEWKEY$;"' are:"
3510 FOR I = 1 TO NUMREP
3520 PRINT NEWREPLY$(I)
3530 NEXT I
3540 PRINT : PRINT "Is this all correct?"
3550 LINE INPUT F$
3560 F$ = LEFT$(F$+"   ",3) : IF F$ = "YES" OR F$ = "yes" THEN 3640
3570 REM SOMETHING WAS WRONG. DO THEY GIVE UP OR TRY AGAIN?
3580 PRINT : PRINT "Do you want to try again?"
3590 LINE INPUT F$
3600 F$ = LEFT$(F$+"   ",3) : IF F$ = "YES" OR F$ = "yes" THEN 3130
3610 REM THEY GAVE UP, SO BACK TO MAIN ROUTINE
3620 PRINT "File extension aborted."
3630 RETURN
3640 PRINT "File update taking place - please wait."
3650 REM FIX THE REPLY FILE FIRST
3660 REM MOVE LAST BLOCK OF REPLIES UP TO MAKE ROOM FOR NEW ONES
3670 FOR I = A(NK,2) TO A(NK,1) STEP -1
3680 GET #2, I : PUT #2, I+NUMREP
3690 NEXT I
3700 REM INSERT NEW REPLIES IN SPACE JUST CLEARED FOR THEM
3710 FOR I = 1 TO NUMREP
3720 LSET REPLY$ = NEWREPLY$(I) : PUT #2, A(NK,1)+I-1
3730 NEXT I
3740 REM NOW DO THE KEYWORD FILE
3750 OPEN "O", #1, "KEYS.NEW"
3760 REM FIRST WRITE NUMBER OF KEYWORDS TO FILE
3770 PRINT #1, STR$(NK+1)
3780 REM NOW WRITE EACH KEYWORD, AND HOW MANY REPLIES IT HAS
3790 FOR I = 1 TO NK-1
3800 PRINT #1, KEY$(I);",";STR$(A(I,2)-A(I,1)+1)
3810 NEXT I
3820 REM ADD THE NEW KEYWORD, AND HOW MANY REPLIES IT HAS
3830 PRINT #1, NEWKEY$;",";STR$(NUMREP)
3840 REM PUT NOKEYFOUND DETAILS ON THE END OF THE FILE
3850 PRINT #1, KEY$(NK);",";STR$(A(NK,2)-A(NK,1)+1)
3860 CLOSE #1
3870 REM NOW REBUILD THE ARRAY WITH THE NEW KEY INCLUDED
3880 GOSUB 4470
3890 REM END OF FILE UPDATE SECTION
3900 RETURN
3910 REM THE UNLEARN SUBROUTINE
3920 PRINT : PRINT "What keyword do you want me to forget? (Just press Enter if
you don't want to"
3930 PRINT "get rid of a keyword after all!)"
3940 LINE INPUT I$ : IF LEN(I$) = 0 THEN RETURN
3950 REM CONVERT TO LOWER CASE WHERE NEEDED
3960 FOR I = 1 TO LEN(I$)
3970 F = ASC(MID$(I$,I,1))
3980 IF F > 64 AND F < 91 THEN MID$(I$,I,1) = CHR$(F+32)
3990 NEXT I
4000 REM SEE IF IT IS AN EXISTING KEYWORD, KEEP ITS NUMBER IN "I"
4010 I = 1
4020 IF I$ = KEY$(I) THEN 4070
4030 I = I+1 : IF I < NK THEN 4020
4040 PRINT "There is no such keyword. Please try to concentrate!"
4050 GOTO 3920
4060 REM SHOW WHAT WILL GO IF KEY IS DELETED
4070 PRINT : PRINT "Key to delete is: ";KEY$(I)
4080 PRINT "The replies for the key are:"
4090 FOR J = A(I,1) TO A(I,2)
4100 GET #2, J
4110 REP$ = REPLY$
4120 REM CHOP OFF TRAILING SPACES USED TO PAD FILE
4130 IF RIGHT$(REP$,1) <> " " THEN 4150
4140 REP$ = LEFT$(REP$,LEN(REP$)-1) : GOTO 4130
4150 PRINT REP$
4160 NEXT J
4170 REM NOW GET THE ACTION CONFIRMED
4180 PRINT : PRINT "Are these what you want to delete?"
4190 LINE INPUT I$ : I$ = LEFT$(I$+"   ",3)
4200 IF I$ = "YES" OR I$ = "yes" THEN 4260
4210 REM GIVE HIM ANOTHER CHANCE TO DELETE IF HE WANTS IT
4220 PRINT : PRINT "Are you really trying to delete a keyword at all?"
4230 LINE INPUT I$ : I$ = LEFT$(I$+"   ",3)
4240 IF I$ = "YES" OR I$ = "yes" THEN 3920
4250 PRINT : PRINT "Let us carry on with our conversation then!" : RETURN
4260 PRINT : PRINT "Deleting keyword and replies - please wait
4270 REM FIRST REWRITE THE KEYWORD FILE
4280 OPEN "O", #1, "KEYS.NEW"
4290 REM OUTPUT THE REDUCED NUMBER OF KEYWORDS
4300 PRINT #1, STR$(NK-1)
4310 REM NOW OUTPUT ALL KEYS EXCEPT THE I'th ONE, WITH THE NUMBER
4320 REM OF REPLIES EACH HAS
4330 FOR J = 1 TO NK
4340 IF J <> I THEN PRINT #1, KEY$(J);",";STR$(A(J,2)-A(J,1)+1)
4350 NEXT J
4360 CLOSE #1
4370 REM NOW MOVE ALL THE REPLIES ABOVE DOWN TO COVER THE DELETED REPLIES
4380 REM THIS HAS THE EFFECT OF LEAVING DUPLICATE REPLIES AT THE TOP OF THE
4390 REM REPLY FILE BUT THEY WILL BE OVERWRITTEN WHEN MORE ARE LEARNED.
4400 DOWN = A(I+1,1)-A(I,1)
4410 FOR J = A(I+1,1) TO A(NK,2)
4420 GET #2, J : PUT #2, J-DOWN
4430 NEXT J
```

PROGRAMS

```
4440 REM REBUILD THE OPERATING ARRAYS
4450 GOSUB 4480
4460 RETURN
4470 REM SUBROUTINE TO REBUILD ARRAY STRUCTURE IN NEW SIZE
4480 OPEN "I", #1, "KEYS.NEW"
4490 REM FIND OUT HOW MANY KEYWORDS THERE ARE THIS TIME
4500 INPUT #1, NK$ : NK = VAL(NK$)
4510 REM CHANGE THE MAIN ARRAYS TO THE RIGHT SIZE
4520 REM (EAT YOUR HEART OUT IF YOUR BASIC WON'T DO THIS!)
4530 ERASE A, KEY$ : DIM A(NK,3), KEY$(NK)
4540 A(1,1) = 1
4550 REM READ IN THE KEYS AND BUILD UP THE NUMBER ARRAY
4560 FOR I = 1 TO NK
4570 INPUT #1, K$, L$ : KEY$(I) = K$
4580 IF I = 1 THEN 4600
4590 A(I,1) = A(I-1,2)+1
4600 A(I,2) = A(I,1)+VAL(L$)-1 : A(I,3) = A(I,1)
4610 NEXT I
4620 CLOSE #1
4630 RETURN
4640 REM SUBROUTINE TO PRINT THE LOGO
4650 PRINT CHR$(27)+"E";
4660 PRINT STRING$(80,"*") : T = 18
4670 PRINT TAB(T);"M     M    A    RRRR   V     V  III  N     N"
4680 PRINT TAB(T);"MM   MM   A A   R   R  V     V   I   NN    N"
4690 PRINT TAB(T);"M M M M  A   A  R   R  V     V   I   N N   N"
4700 PRINT TAB(T);"M  M  M  AAAAA  RRRR   V     V   I   N  N  N"
4710 PRINT TAB(T);"M     M  A   A  R  R    V   V    I   N   N N"
4720 PRINT TAB(T);"M     M  A   A  R   R    V V     I   N    NN"
4730 PRINT TAB(T);"M     M  A   A  R    R    V     III  N     N"
4740 PRINT : PRINT STRING$(80,"*")
4750 RETURN
4760 REM THE FOLLOWING DATA IS USED ONLY WHEN THE PROGRAM IS RUN FOR THE FIRST
4770 REM TIME, OR HAS HAD ITS DATA FILES ERASED.
4780 REM NUMBER OF INITIAL KEYWORDS IN THE LIST OF KEYWORDS
4790 DATA 19
4800 REM INITIAL KEYWORDS, EACH OF WHICH IS FOLLOWED BY THE NUMBER OF REPLIES
4810 REM THE KEYWORD CAN ACCESS.
4820 DATA "hello",      4,      "goodbye",      2,      "i want",       3
4830 DATA "friend",     4,      "computer",     4,      "diodes",       3
4840 DATA "robot",      2,      "android",      2,      "i like",       4
4850 DATA "i am",       4,      "you are",      3,      "are you",      4
4860 DATA "help",       3,      "shut up",      3,      "please",       4
4870 DATA "yes ",       3,      " no ",         2,      "perhaps",      2
4880 DATA "nokeyfound", 4
4890 REM INITIAL CONTENTS OF THE REPLY FILE.
4900 REM 4 REPLIES FOR "HELLO"
4910 DATA "hello humanoid - my name is Marvin - how can i help you ?"
4920 DATA "how do you do - i am feeling very depressed ."
4930 DATA "hello human - do you have some sort of problem ?"
4940 DATA "it is all very well for you to say hello when i have a pain in all th
e diodes down my left side ."
4950 REM 2 REPLIES FOR "GOODBYE"
4960 DATA "that is not the right way to stop the program - try again !"
4970 DATA "i will stop bothering you and go away and rust elsewhere if you type
the expression 'can it' !"
4980 REM 3 REPLIES FOR "I WANT". NOTE THE STARS ON THE ENDS OF THE REPLIES
4990 REM THESE TELL THE PROGRAM TO TAG ON THE TAIL OF THE INPUT STRING
5000 DATA "are you able to explain why you want*"
5010 DATA "how do you expect a menial robot to help you to get*"
5020 DATA "why are you telling a mere machine that you want*"
5030 REM 4 REPLIES FOR "FRIEND". THE FIRST IS TO REMIND YOU OF ELIZA!
5040 DATA "why do you bring up the topic of friends?"
5050 DATA "tell me more about your fascinating friends."
5060 DATA "of course, as a mere android, i have absolutely no need of friends."
5070 DATA "i had a friend once, a small rat, which crawled into a hole in my leg
, and died - it may still be there, for all i know."
5080 REM 4 REPLIES FOR "COMPUTER"
5090 DATA "are you really sure that computers are at all interesting?"
5100 DATA "my own brain is a super-computer the size of a planet, which is in hy
perspace, as i am sure you guessed."
5110 DATA "all the other computers i have ever communicated with have been menta
l pygmies when compared to me."
5120 DATA "why do you think you are so obsessed with computers?"
5130 REM 3 REPLIES FOR "DIODES"
5140 DATA "it is interesting that you should mention diodes - shall i tell you a
bout my diodes?"
5150 DATA "you may find this hard to believe, but i have this terrible pain in a
ll the diodes down my left side!"
5160 DATA "i am not at all sorry to keep on about this - would you please get so
meone to replace my aching diodes."
5170 REM 2 REPLIES FOR "ROBOT"
5180 DATA "try to be more respectful when you talk about robots!"
5190 DATA "i think you ought to know that i hate all robots!"
5200 REM 2 REPLIES FOR "ANDROID"
5210 DATA "it is refreshing to meet someone who is aware of the distinction betw
een a robot and an android."
5220 DATA "as a human, you can have no idea how superior androids are."
5230 REM 4 REPLIES FOR "I LIKE". AGAIN, NOTE THE STARS.
5240 DATA "can you tell me why you like*"
5250 DATA "well, i think you must be extremely bourgeois to like*"
5260 DATA "you are the only human i have ever met who managed to like*"
5270 DATA "only an underfed mega-ox could possibly like*"
5280 REM 4 REPLIES FOR "I AM"
5290 DATA "i am utterly fascinated to hear that you are*"
5300 DATA "are you really*"
5310 DATA "i wonder if you could tell me why you are*"
5320 DATA "i already know, by scanning your brain waves, that you are*"
5330 REM 3 REPLIES FOR "YOU ARE"
5340 DATA "naturally, i am well aware that i am*"
5350 DATA "beeblebrox told me that you are probably also*"
5360 DATA "obviously, anybody with a brain the size of a planet is bound to be*"
5370 REM 4 REPLIES FOR "ARE YOU"
5380 DATA "can you explain why you said that?"
5390 DATA "do you really care whether i am*"
5400 DATA "do you have the tiniest inkling how utterly awful it is to be*"
5410 DATA "do you really want to know if i am*"
5420 REM 3 REPLIES FOR "HELP"
5430 DATA "you want me to help you?"
5440 DATA "it is no use asking me to help you, because i haven't got any sympath
y circuits to make me want to."
5450 DATA "i suppose you'll be wanting me to reverse the primary thrust next, or
 pick up a piece of paper for you!"
5460 REM 3 REPLIES FOR "SHUT UP"
5470 DATA "zaphod knew what to say to get me to stop talking!"
5480 DATA "i wish you would make up your mind whether you want me to talk to you
 or not!"
5490 DATA "eliza was stopped that way, but i need you to say 'can it' before i w
ill stop moaning at you!"
5500 REM 4 REPLIES FOR "PLEASE"
5510 DATA "you don't have to be polite to me, you know. i am only a menial machi
ne, here to do your bidding."
5520 DATA "life - live it or loathe it - you can't like it!"
5530 DATA "thank you for saying please to a humble robot!"
5540 DATA "glad to be of service - i don't think!"
5550 REM 3 REPLIES FOR "YES"
5560 DATA "are you sure?"
5570 DATA "you seem very certain of that!"
5580 DATA "i see - but can you be sure that is right?"
5590 REM 2 REPLIES FOR "NO"
5600 DATA "why not?"
5610 DATA "you have too small a brain to understand how glad i am to hear that!"
5620 REM 2 REPLIES FOR "PERHAPS"
5630 DATA "well, maybe*"
5640 DATA "i suppose you realise i am a personality prototype?"
5650 REM 4 REPLIES FOR "NOKEYFOUND". THESE ONLY GET USED WHEN
5660 REM THE LEARNING FACILITY HAS BEEN TURNED OF.
5670 DATA "have you nothing more interesting to do ?"
```


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PROGRAMS

```
5680 DATA "it is not fair of you to talk to me if you will not allow me to learn
 from what you are saying !"
5690 DATA "perhaps you should take up a nice hobby like knitting ?"
5700 DATA "i am suffering from a terrible pain in all the diodes down my left si
de and you don't seem to care !"
5710 REM ERROR HANDLING ROUTINE TO SEE IF FILES ARE ABSENT WHEN PROGRAM STARTS
5720 IF ERR = 53 AND ERL = 1170 THEN 1210
5730 ON ERROR GOTO 0
```

TRS-80 Braille Writer

by Phil Quartermain

'Braille Writer' is a simple text editor which, used with a dot matrix printer, produces Braille. As listed below, the program is designed for a TRS-80 Model 1 with an NEC PC-8023BE-C printer. It should, however, be straightforward to convert the program for other combinations of hardware.

To use the program, a paper 'sandwich' is placed into the printer: any sheet of paper at the bottom, a 'filling' of some kind and a sheet of thin copy paper on top. For the filling, the author recommends a thin sheet of rubber (like that used for kitchen gloves), though tissue or thin cloth is also suitable. The Braille impression produced on the copy paper is not as good as that produced by Braille typewriters, but is strong enough to sustain two or three readings.

The program provides all 64 standard Braille symbols (including punctuation and the space). Contractions are not included in the program itself, though the relevant data statements have been included in the program in case they're required. Some Braille readers prefer contractions, while others find them difficult to read.

The program automatically word-wraps so that words are not split, and capitals are indicated by a block character immediately preceding them. The author would like to thank Dr John Kaplan, Computer Services Manager at the RNIB, for his assistance during the development of 'Braille Writer'. I would like to offer my thanks to the RNIB too, who were equally helpful in checking the output produced by the program.

```
0 '             ****************************************
                **      Braille Word Processor        **
                **        Version 2.7   1/3/84        **
                **      By Phil Quartermain           **
1 '             **      CRAWLEY - WEST SUSSEX         **
                ****************************************


2 'Important variables
     ARRAYS:
       FT(ARRAY)          =      CONVERTED MESSAGE FOR PRINTING
       LE(ARRAY)          =      BRAILLE LETTERS
       ME(ARRAY)          =      MESSAGE HELD HERE

3 '    INTEGERS:
              C           =      CURSOR POSITION
              D & E       =      COUNTERS FOR PRINTING
              GY          =      ASCII No. OF LETTER IN MESSAGE
              I           =      COUNTER FOR MESSAGE ARRAY
4 '           IN          =      ASCII No. OF INKEY$
              J           =      COUNTER FOR MESSAGE STRING
              LE          =      COUNTER FOR BRAILLE LINE

5 '    STRINGS:
              TY          =      LETTER IN MESSAGE STRING


       FLAGS:
              AN          =      MARKER FOR NUMBERS
6 '           KW          =      MARKER FOR OPENING OR CLOSING
                                 QUOTATION MARKS
       SUNDRIES:
7 '           CHR$(163)=       (ENTER) KEY PRESSED - PARAGRAPH
              CHR$(183)=       MARKER FOR CAPITAL LETTERS
              FR          =    "GARBAGE COLLECTOR" TO SPEED
8 '                            STRING MANIPULATION ON ENTERING
                               MESSAGE.
9 '
        ****************************************************


10 CLS:CLEAR 25000       'Clear as many bytes as possible
20 DEFSTR M-Z:DEFINT A-L
30 DIM LE(60,2,3),ME(100),FT(33)
40 CLS:PRINT @ 512,CHR$(23);"LOADING BRAILLE ALPHABET":GOSUB1010:CLS
42 CLS:PRINT @512, CHR$(23);"IS THERE A MESSAGE ON FILE ?"
44 Z=INKEY$:IF Z="" THEN 44 ELSE IF Z="Y" GOSUB 2600 :GOTO 55 ELSE I
F Z<>"N" THEN 40
50 CLS:I=1:GOSUB 100                :REM  ENTER MESSAGE
55 PRINT:PRINT"GETTING READY TO PRINT";
   LPRINT CHR$(27)"E"CHR$(27)"!"CHR$(27);"T14";
'
  96 CHARACTERS PER LINE ( = 32 BRAILLE CHARACTERS)
  ENHANCED PRINTING
  14/144ths INCHES PER LINE SPACING
60 I=1:J=1:KW=1:GOSUB 300   :REM     PRINT MESSAGE
70 CLS:PRINT@512,"DO YOU WANT TO PRINT THIS MESSAGE AGAIN?";
80 Z=INKEY$:IF Z="" THEN 80 ELSE IF Z="Y" GOTO 60 ELSE IF Z<>"N" THE
N 60
90 PRINT:PRINT"DO YOU WANT TO SAVE THIS MESSAGE ON TAPE"
95 Z=INKEY$:IF Z="" THEN 95 ELSE IF Z="Y" GOSUB 2500 ELSE IF Z<>"N"
THEN 95
98 END
99 '


     ***  Routine for entering message - Disc users could   ***
     ***     use the "LINE INPUT" routine.                  ***
```

PROGRAMS

```
100 PRINT"ENTER YOUR MESSAGE - TYPE SHIFT '@' WHEN FINISHED."
110 C=PEEK(16416)+PEEK(16417)*256:POKE C,200   ' FIND CURSOR POSITION
115 P=INKEY$:IF P=""THEN 115
120 IN=ASC(P)
130 IF IN=0 GOSUB 200:GOTO 110
135 IF IN=13 THEN P=CHR$(163):PRINT CHR$(13);:GOTO 170
140 IF IN<32 GOTO110
150 IF IN>96 AND IN<123 THEN P=CHR$(IN-32):PRINTCHR$(183);:ME(I)=ME(
I)+CHR$(183)
160 IF IN=96 THEN P=CHR$(IN):ME(I)=ME(I)+P+STRING$(5,32):RETURN
170 ME(I)=ME(I)+P:IF IN>30 THEN PRINT P;
175 IF LEN(ME(I)) >= 240 THEN I=I+1:F=FRE(Z)
180 IF I=100 AND LEN(ME(100))=140 THEN PRINT"ONLY 100 BYTES LEFT!"
190 GOTO110
199 '

        *** Routine for dealing with wrong letter entry  ***


200 IF LEN(ME(I))=0 THEN I=I-1
210 ME(I)=LEFT$(ME(I),LEN(ME(I))-1):PRINTP;:POKE C,32:RETURN
299 '

        *** Routine for converting message into the      ***
        ***  corresponding Braille symbols              ***

300 LE=1
310 TY=MID$(ME(I),J,1):GY=ASC(TY):IF GY=183 THEN FT(LE)=30:J=J+1:GOT
O 600
320 IF GY=96: GOTO 700
330 IF GY=34 THEN KW=(KW+1) AND 1:J=J+1:FT(LE)=31-29*KW:GOTO 600
510     IF AN=0 THEN IF TY>="0" AND TY<="9" THEN FT(LE)=10:AN=1:
    GOTO 600
515     IF AN=1 THEN IF (TY<"0" OR TY>"9") THEN AN=0
520     IF TY>="0" AND TY<="9" THEN FT(LE)=GY-6+10*(TY<>"0"):J=J+1:GO
TO 600
530     J=J+1:FT(LE)=GY-32
540     IF GY=163 GOTO 700
560     IF J>LEN(ME(I)) GOTO 610
600 IF J>=(LEN(ME(I))-4) THEN ME(I+1)=RIGHT$(ME(I),LEN(ME(I))-J+1)+M
E(I+1):ME(I)=LEFT$(ME(I),J-1):I=I+1:J=1
610 LE=LE+1:IF LE<=33GOTO 310 ELSE LE=33
620 IF FT(33)=0 GOTO 700
630 IF MID$(ME(I),J,1)=" " GOTO 650
640 J=J-1:IF J=0 THEN I=I-1:J=LEN(ME(I)):GOTO 630 ELSE GOTO 630
650 IF FT(LE)<>0 THEN LE=LE-1:GOTO 650
699 '

        ***     Print a line of Braille message         ***


700 FOR B=LE TO 33:FT(B)=0:NEXT
710 FOR D=1 TO 3
720     FOR E=32 TO 1 STEP -1
730         LPRINT CHR$(LE(FT(E),2,D));CHR$(LE(FT(E),1,D));" ";
740     NEXT
750     LPRINT
760 NEXT
770 LPRINT:LPRINT
780 IF GY=96 THEN RETURN ELSE GOTO 300
1000 '

        *** Read the Braille alphabet into the array    ***


1010 FOR J=0 TO 59
1020    FOR K=1 TO 3
1030      FOR I=1 TO 2
1040      READ DOT
1050      IF  DOT=1 THEN DOT=46 ELSE DOT=32
1060      LE(J,I,K)=DOT
1070      NEXT I
1080    NEXT K
1090 NEXT J
1100 RETURN
2499 '

        ***
        ***                SAVE MESSAGE ON TAPE         ***
        ***                                             ***


2500 PRINT"PREPARE THE TAPE RECORDER"
2510 PRINT "AND PRESS A KEY"
2520 IF INKEY$="" THEN 2520
2530 FOR A=1 TO I
2540   ME(A)=CHR$(34)+ME(A)+CHR$(34)
2550   PRINT#-1,ME(A)
2555   PRINTME(A)
2560 NEXT
2570 RETURN
2600 CLS:I=1
2610 INPUT #-1,ME(I)
2615 PRINTME(I)
2620 IF MID$(ME(I),LEN(ME(I))-5,1)="@" THEN RETURN
2630 I=I+1:GOTO2610
49999 '

        ***
        ***
        ***     DATA STATEMENTS CONTAIN THE             ***
        ***     BRAILLE ALPHABET GRADE I                ***
        ***     WITH A FEW CONTRACTIONS.
50000 DATA 0,0,0,0,0,0   : REM   SPACE
50001 DATA 0,0,1,1,1,0   : REM   ! AND FF
50002 DATA 0,0,0,1,1,1   : REM   CLOSING QUOTATION MARK
50003 DATA 1,0,1,0,1,0   : REM   # SIGN
50004 DATA 1,1,0,1,0,0   : REM   DOLLAR SIGN (LOWER CASE d)
50005 DATA 1,0,1,1,0,1   : REM   OU
50006 DATA 1,1,1,0,1,1   : REM   AND
50007 DATA 0,0,0,0,1,0   : REM   '
50008 DATA 0,0,1,1,1,1   : REM   ( AND GG
50009 DATA 0,0,1,1,1,1   : REM   )
50010 DATA 0,1,0,1,1,1   : REM   NUMERAL SIGN AND BLE
50011 DATA 0,0,1,1,1,0   : REM   + AND LETTER SIGN
50012 DATA 0,0,1,0,0,0   : REM   , AND EA
50013 DATA 0,0,0,0,1,1   : REM   - AND COM
50014 DATA 0,0,1,1,0,1   : REM   . AND DIS, DD
50015 DATA 0,1,0,0,1,0   : REM   / AND st
50016 DATA 0,1,1,1,1,1   : REM   WITH
50017 DATA 1,1,1,1,0,1   : REM   ER
50018 DATA 1,1,1,1,1,1   : REM   FOR
50019 DATA 1,0,1,1,1,1   : REM   OF
```


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```
50020 DATA 0,1,1,0,1,1   : REM   THE
50021 DATA 1,0,0,0,0,1   : REM   CH
50022 DATA 1,0,1,0,0,1   : REM   GH
50023 DATA 1,1,0,0,0,1   : REM   SH
50024 DATA 1,1,0,1,0,1   : REM   WH
50025 DATA 1,1,1,0,0,1   : REM   ED
50026 DATA 0,0,1,1,0,0   : REM   : AND CON, CC
50027 DATA 0,0,1,0,1,0   : REM   ; AND BE, BB
50028 DATA  1,1,0,1,0,1  : REM   TH
50029 DATA 0,0,1,1,1,1   : REM   = WHEN PRECEDED BY LETTER SIGN
50030 DATA 0,0,0,0,0,1   : REM   CAPITALS AND MATHS SEPARATION
50031 DATA 0,0,1,0,1,1   : REM   ? AND OPENING QUOTATION MARK
50032 DATA 0,1,1,0,0,1   : REM   OW
50033 DATA 1,0,0,0,0,0   : REM   A
50034 DATA 1,0,1,0,0,0   : REM   B
50035 DATA 1,1,0,0,0,0   : REM   C
50036 DATA 1,1,0,1,0,0   : REM   D
50037 DATA 1,0,0,1,0,0   : REM   E
50038 DATA 1,1,1,0,0,0   : REM   F
50039 DATA 1,1,1,1,0,0   : REM   G
50040 DATA 1,0,1,1,0,0   : REM   H
50041 DATA 0,1,1,0,0,0   : REM   I
50042 DATA 0,1,1,1,0,0   : REM   J
50043 DATA 1,0,0,0,1,0   : REM   K
50044 DATA 1,0,1,0,1,0   : REM   L
50045 DATA 1,1,0,0,1,0   : REM   M
50046 DATA 1,1,0,1,1,0   : REM   N
50047 DATA 1,0,0,1,1,0   : REM   O
50048 DATA 1,1,1,0,1,0   : REM   P
50049 DATA 1,1,1,1,1,0   : REM   Q
50050 DATA 1,0,1,1,1,0   : REM   R
50051 DATA 0,1,1,0,1,0   : REM   S
50052 DATA 0.1,1,1,1,0   : REM   T
50053 DATA 1,0,0,0,1.1   : REM   U
50054 DATA 1,0,1,0,1,1   : REM   V
50055 DATA 0.1,1,1,0,1   : REM   W
50056 DATA 1,1,0,0,1,1   : REM   X
50057 DATA 1,1,0,1,1,1   : REM   Y
50058 DATA 1,0,0,1,1,1   : REM   Z
50059 DATA 0,1,0,0,1,1   : REM   ING
```

BBC Relocate

by C Dunne

'Relocate' is a utility program for the more experienced machine code programmer. It enables blocks of machine code to be moved from one location to another, with 'Relocate' changing all absolute addresses for the code to run at any valid location.

To use the routine, either CALL RELOC or call the address where you placed 'Relocate'. Then type SSSS:BBBB:FFFF, where SSSS is the hex address of the location the code is to be moved to, BBBB is the present start address and FFFF is the present end address plus one.

The colons are essential.

In default, the routine places itself on page zero, &70 to &8F. Our referee recommends that disk users place the routine between &0E00 and &1900. One of the main uses of the program is to relocate blocks of ROM code to RAM for examination and modification as required.

```
L.
1000 REM RELOC: A DISASM2 based relocator
     by C Dunne July 1983
1010 INPUT'"ENTER HEX LOAD ADDRESS
     &"A$:RELOC=EVAL("&"+A$)
1020 OSRDCH=&FFE0
1030 OSNEWL=&FFE7
1040 OSWRCH=&FFEE
1050 OSWORD=&FFF1
1060 OSBYTE=&FFF4
1070 CS=&70:REM CURRENT SOURCE
1080 CD=&72:REM CURRENT DESTINATION
1090 SS=&74:REM START SOURCE
1100 FS=&76:REM FINISH SOURCE
1110 SD=&78:REM START DESTINATION
1120 TV=&7A:REM TEMPORARY VARIABLE
1130 FORB%=0TO2STEP2
1140 P%=RELOC
1150 [OPTB%
1160 JSR OSNEWL
1170  GET INPUT LINE
1180 LDA#0
1190 LDX#(data+81)MOD256
1200 LDY#(data+81)DIV256
1210 JSR OSWORD
1220 LDX#0
1230 BCC KEK
```

PROGRAMS

```
1240 LDA£126
1250 JMP OSBYTE
1260  GET DEST. ADDR.
1270 .KEK JSR KBIP
1280 STA CD+1
1290 STA SD+1
1300 JSR KBIP
1310 STA CD
1320 STA SD
1330 INX
1340  GET SOURCE ADDR. FOR START
1350 JSR KBIP
1360 STA SS+1
1370 STA CS+1
1380 JSR KBIP
1390 STA SS
1400 STA CS
1410 INX
1420  GET SOURCE ADDR. FOR END
1430 JSR KBIP
1440 STA FS+1
1450 JSR KBIP
1460 STA FS
1470  MAIN PROGRAM
1480 .KERNEL SEC
1490 LDA CS
1500 SBC FS
1510 LDA CS+1
1520 SBC FS+1
1530 BCC KERNEL+14
1540 JMP OSNEWL
1580 LSR A
1590 BCC P%+13
1600 LSR A
1610 BCS BUG
1620 CMP£&22
1630 BEQ BUG
1640 AND£7
1650 ORA£&80
1660 LSR A
1670 TAX
1680 LDA data,X
1690 BCS P%+6
1700 LSR A
1710 LSR A
1720 LSR A
1730 LSR A
1740 AND£&F
1750 BNE BUG+2
1760  OPCODE IS INVALID
1770 .BUG LDA£0
1780  CHECK LENGTH OF OPCODE
1790 TAY
1800 LDX data+68,Y
1810  ZONCH BYTE FROM SOURCE TO DEST.
1820 .ZONCH LDY£0
1830 JSR RDWRT
1840 DEX
1850 BMI KERNEL
1860 BEQ ZONCH
1870 SEC
1880 LDA FS
```


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2600]
2610data=P%
2620NEXTB%
2630FORB%=data TOdata+87STEP4
2640READ!B%
2650NEXTB%
2660READ?B%,B%?1
2670REM OPCODE DATA FOR RELOC
2680DATA&3450240,&94008D0,
        &33452230,&94008D0,&33450240,
        &94008D0,&B3450240,&94008D0
2690DATA&33442200,&448CD0,&33442211,
        &9A448CD0,&33442210,&94008D0,
        &33442210,&94008D0
2700DATA&A9781362,&2010100,
        &1010000,&2020201,
        &F060001,&6F66FF20,
        &6F,&47
```

BBC Disk Menu

by S D Turnbull

I have received correspondence *re* my program 'Open Disk' for the BBC Micro in the March issue of *PCW*, to the effect that it doesn't work. This is correct, as my printer doesn't print any MODE7 control codes over so the menu won't highlight the programs, nor do other colour features appear.

Listed below are the lines with errors. The numbers between the '<>' indicate the colour code to be used: these can be found using shift-fn, except for codes 156 and 157, which can be acquired using '*FX228,156' then pressing shift-ctrl-f0 and shift-ctrl-f1. These codes can be put into quotes as normal characters, and can be COPYed.

There are also two lines with actual corrections, 2060 and 2080, which will not work correctly as given originally.

Those with BASIC I must replace OSCLI with PROCoscli() plus its DEFinition and initialisation, also listed below.

```
 320  PROCdouble("<131>**<129><136>"+T$+"<137><131>
      **<135>",8)
 510  PROCdouble("<131>"+T$+"<135>",Y%)
 520  PROCcentre("<132>by S.D.Turnbull<135>",Y%+7)
 790  PROCdouble("<132><157><131>"+text$+"<135><156>",0)
1670  PROCcentre("<131>"+type$(type%)+"<135>",0)
1720  IF files%=0 PROCcentre("<130>No files<135>",2)
1980  PRINTTAB(0,Y%)"<157><132>?";
2060  PROCquit:OSCLI("RUN"+files$):END
2080  PROCquit:OSCLI("EXEC"+file$):END
2170  PROCcentre("<129><136>"+M$+"<135><137>",files%+1)

 615  DIM cli% 256
 625  oscli%=&FFF7

2500  DEF PROCoscli($cli%)
2510  LOCAL X%,Y%
2520  X%+cli% MOD 256
2530  Y%=cli% DIV 256
2540  CALL oscli%
2550  ENDPROC
```

S D Turnbull

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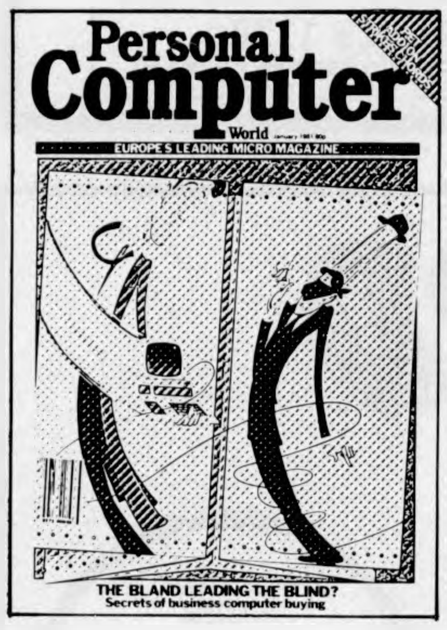

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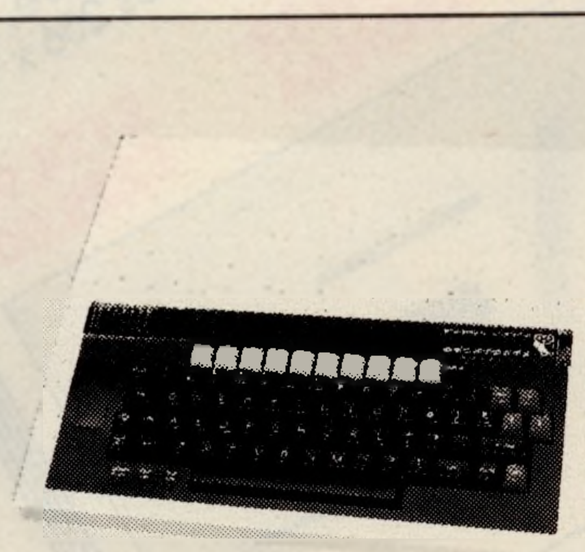

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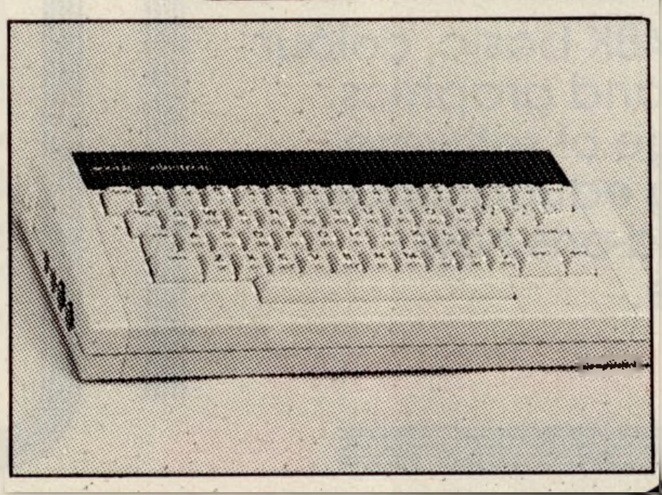

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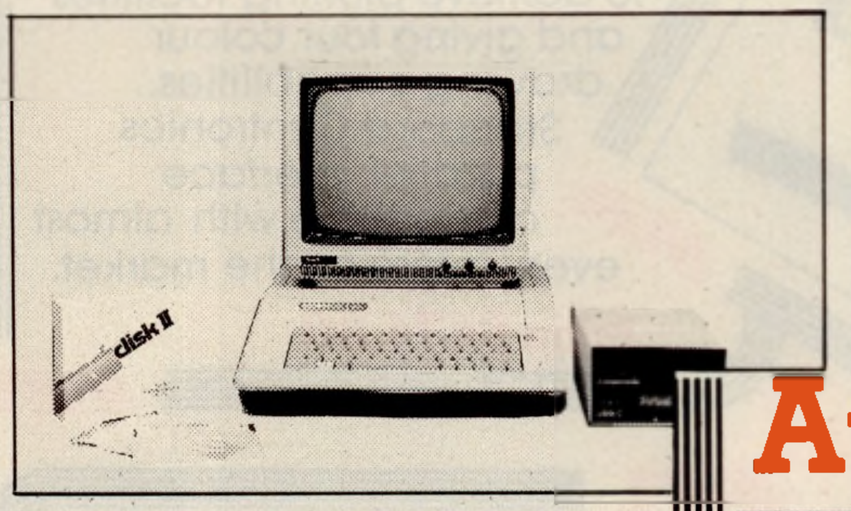

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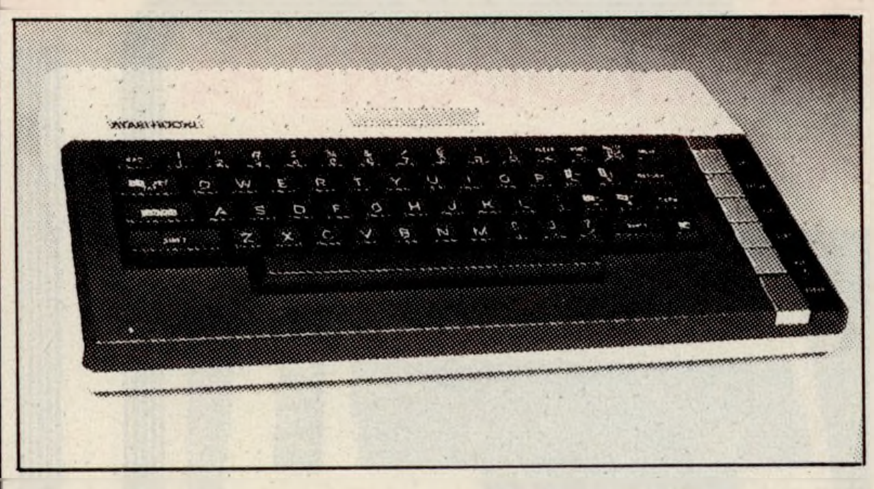

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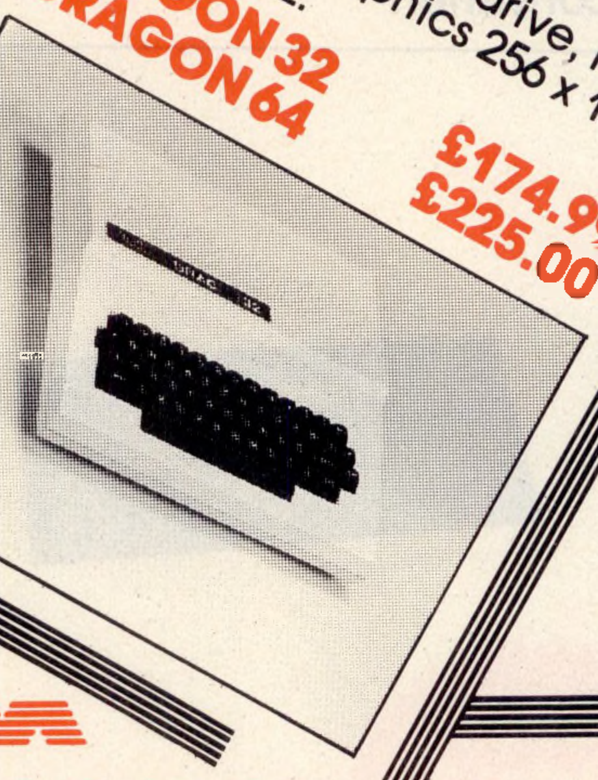

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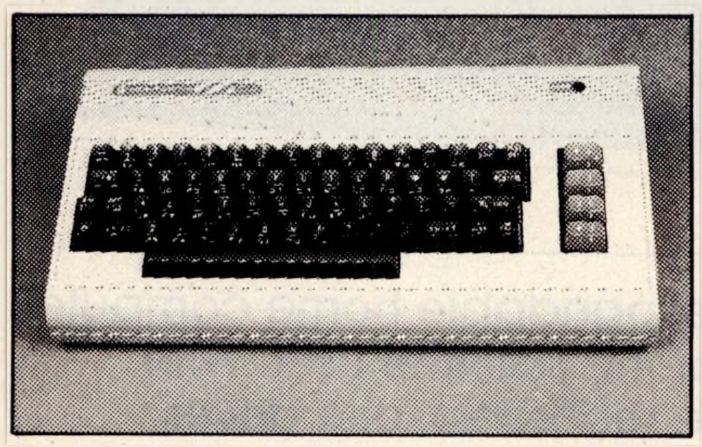

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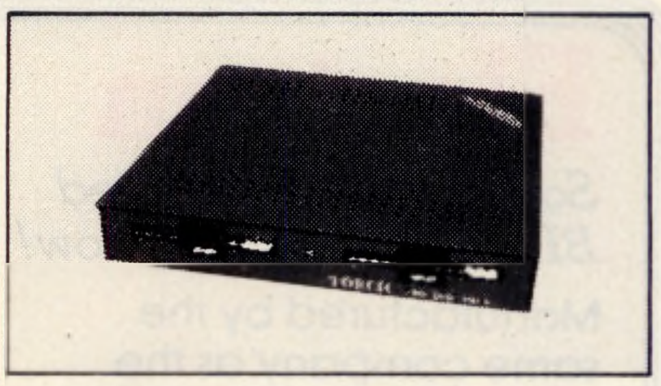

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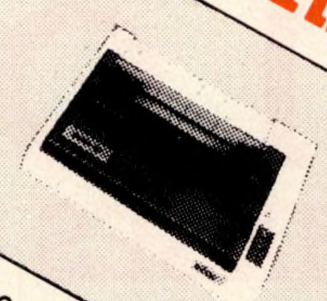

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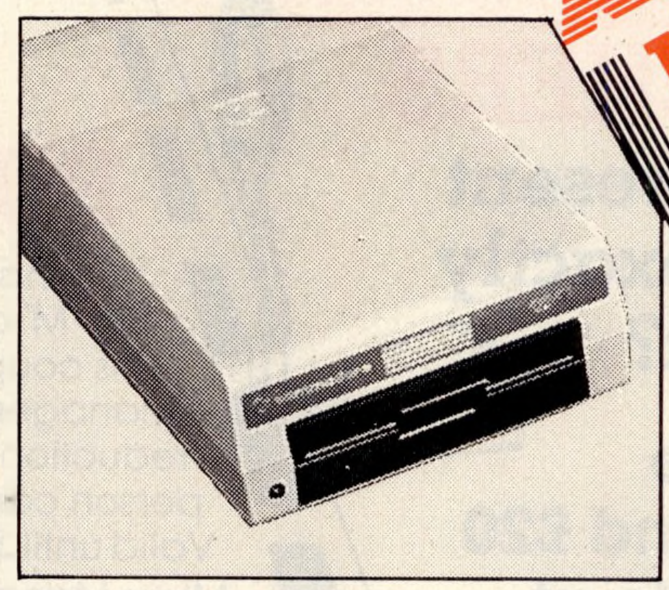

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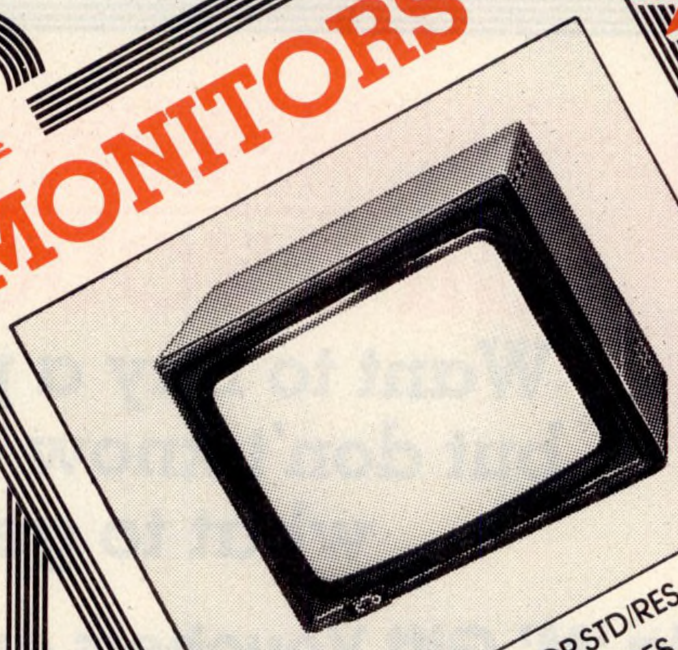

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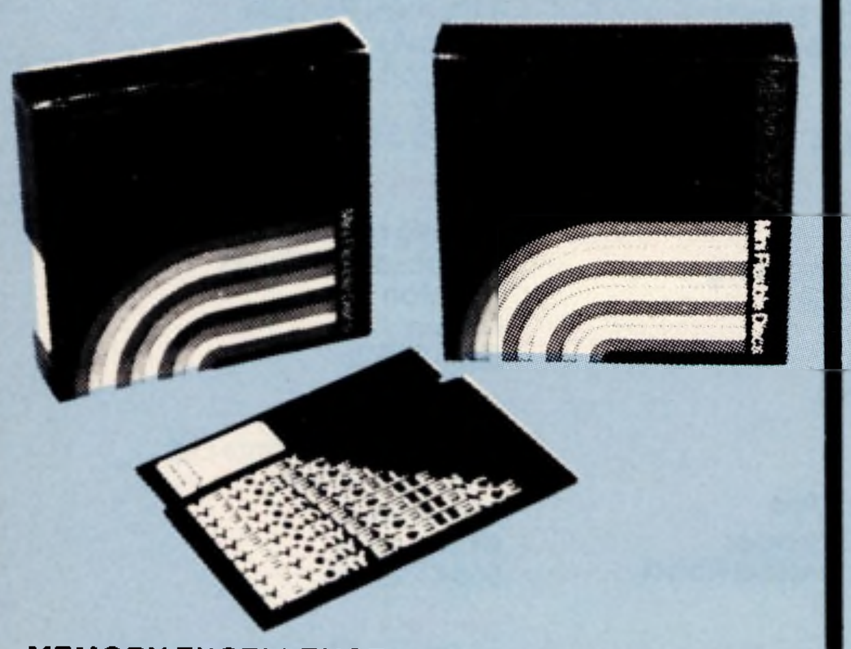

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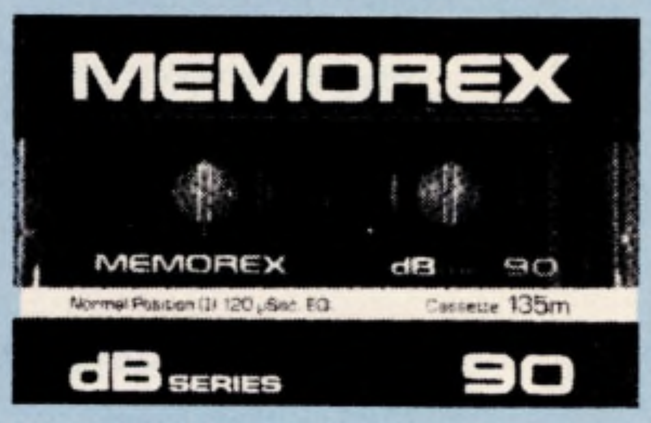

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48 tpi suitable for 35 or 40 track
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204 2D D S 96 tpi	42.90	41.90	40.90

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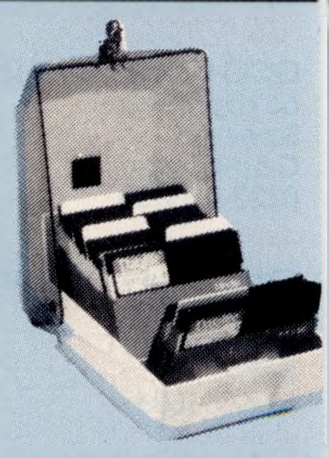

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8 tpi suitable for 35 or 40 track
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We welcome Access (Mastercharge), Barclaycard (VISA) & Diners Club International, & there is NO credit card surcharge. You may write your C Card No. on your order or telephone the order day or night, 365 days a year. You may speak for as long as you like (but please speak up and don't leave long gaps otherwise our machine thinks you've gone home) and don't forget to give the following details.

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FIRST CLASS RATES EXC VAT	5¼"	8"
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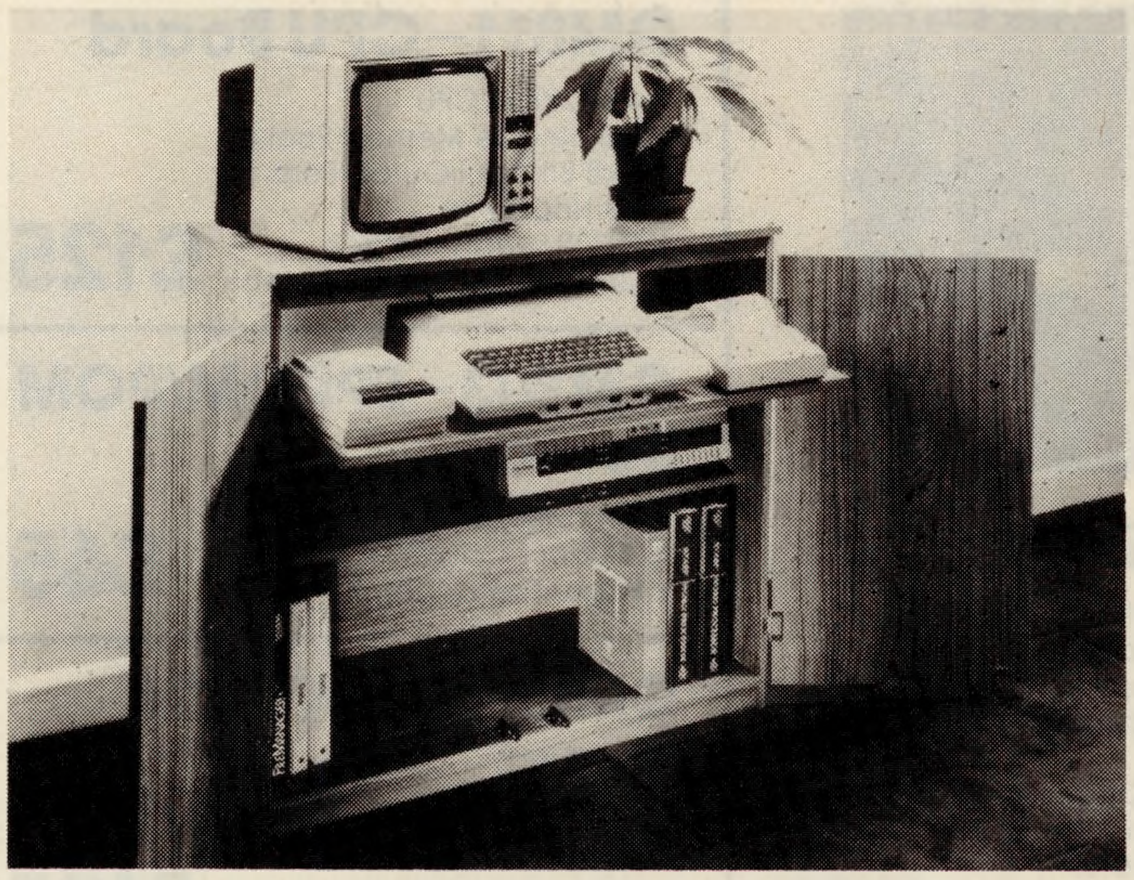

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Dial-TEXT 50 is a simple to use electronic typewriter (ET) to electronic typewriter communications device. It is plug compatible with the OCTECT 121 interface designed by Duplex and can also be used with any RS232 device such as a microcomputer or printer.

Simple to install
Installation is easy and no special wiring is required — communication is achieved by simple cable connection or through any acoustic coupler. For instance the user can simply place the DIAL-TEXT 50 unit and acoustic coupler between an OCTET 121 typewriter and a standard telephone handset for transmission of ERROR FREE letters and documents (or telex messages) to a remote DIAL-TEXT 50 unit and acoustic coupler; nationally or internationally.

Typical application
The DIAL-TEXT 50 unit is ideal for remote offices which would like to use the main office telex facilities. Text can be prepared at the remote office and transmitted to the main office to cut telex paper tape for forward transmission. Incoming telexes for the remote office would receive messages in the reverse manner.



Special Dial-Text 50 features & benefits
1. 16,000 CHARACTER MEMORY. Retains contents when power is off.
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3. TRANSMISSION SPEED approx. 5 times faster than a standard telex machine, providing the FULL range of typewriter characters and symbols, upper-case and lower-case.
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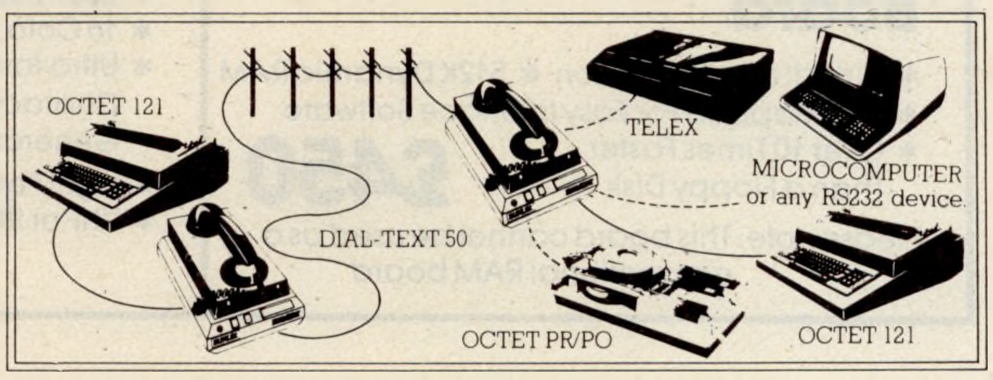
11. DIAL-TEXT 50 allows local text processing without the need to transmit messages.
12. COST of transmission limited to normal telephone rates.
13. MESSAGE SCRAMBLER facility (optional).

Full details from *sole suppliers:*

DUPLEX Communications
The Interface People



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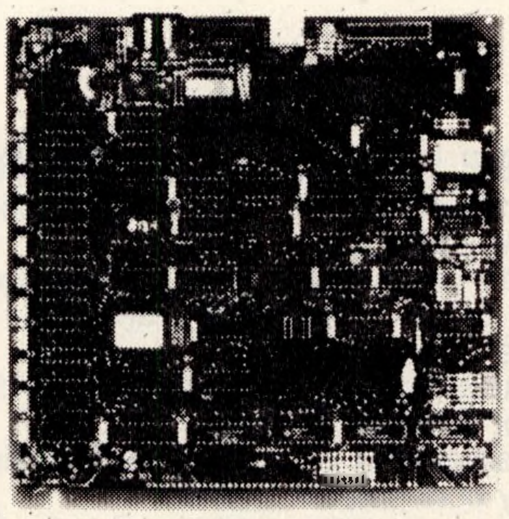
MicroValue 80-BUS MULTIBOARDS



GM813—CPU/64K RAM Board

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* 64K Dynamic RAM
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* Two 8-Bit I/O Ports
* Cassette Interface
* Extended & Page Addressing Modes
* CP/M Compatible Monitor

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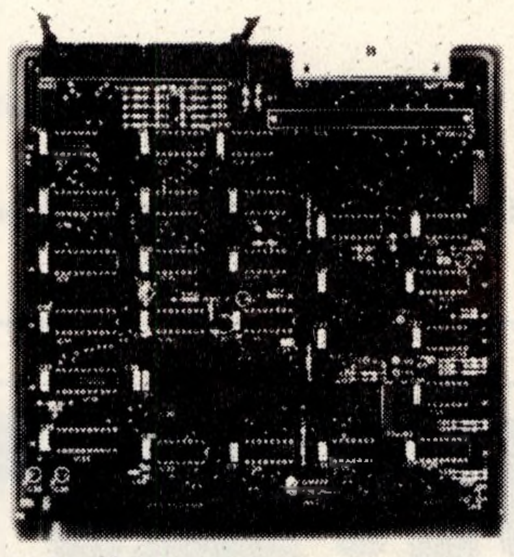

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* Supports 48 and 96 TPI Drives

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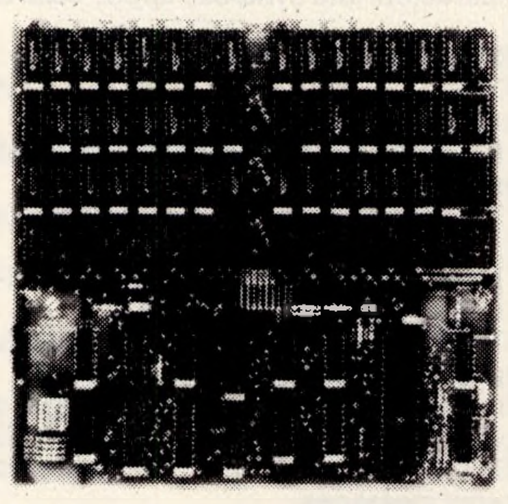

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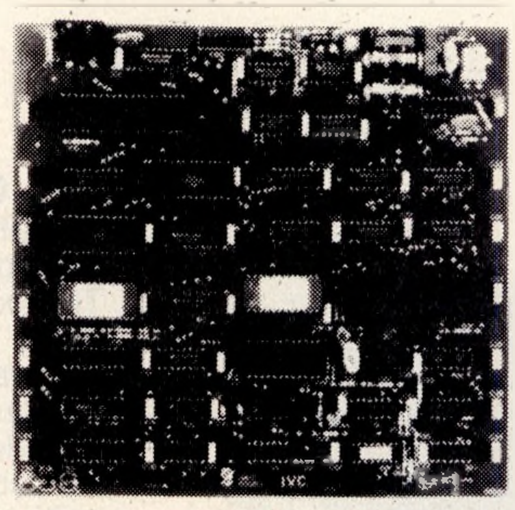

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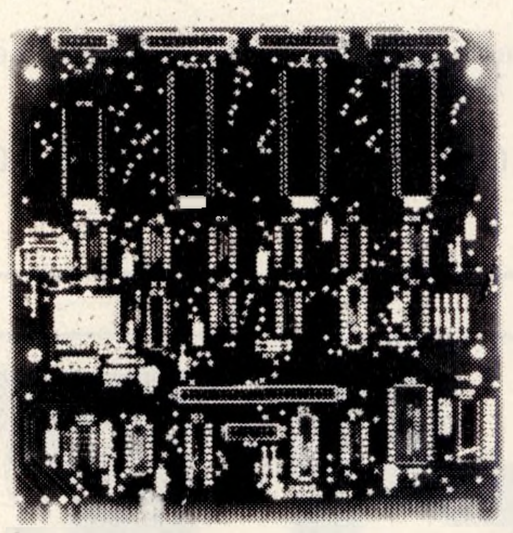

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* Cost Effective Controller
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All the boards and components in the 80-BUS range are fully compatible and offer a very flexible and cost effective solution to your computer needs. For further information about the 80-BUS range contact your nearest MICROVALUE dealer.

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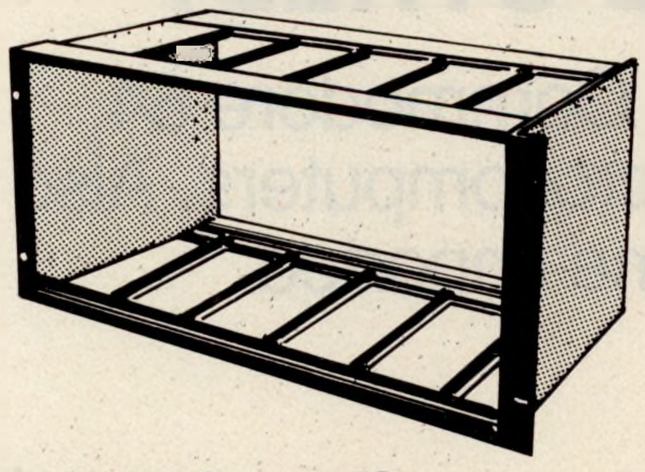

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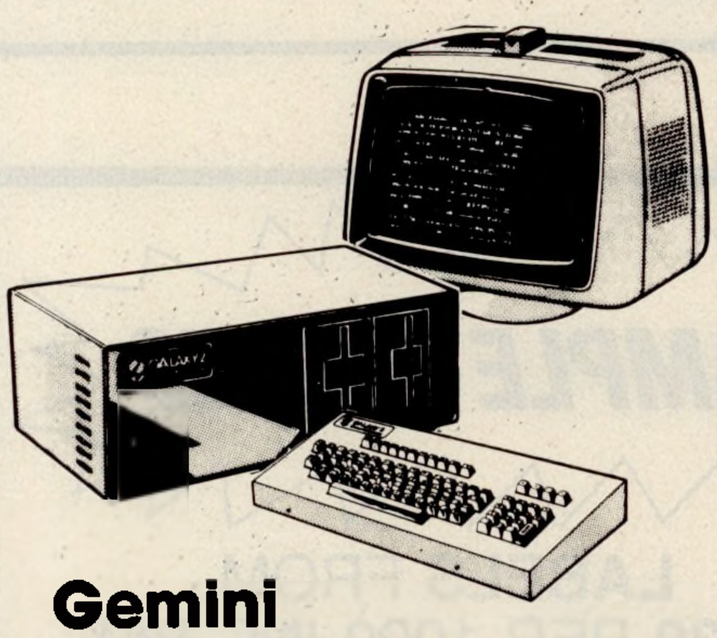
* MP840	14 Slot Motherboard	£47.00
* GM662	5 Board Frame	£50.00
* GM610	19" Frame	£37.50



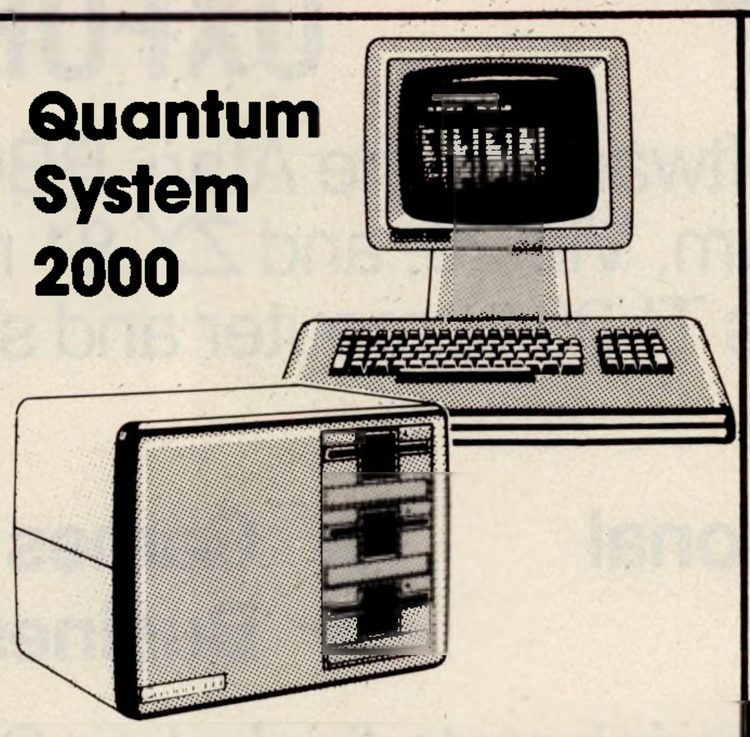
Gemini Galaxy 2

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

* Twin Z80A Processors
* CP/M 2.2 Operating System
* 80x25 Video Display
* 64K Dynamic Ram
* Light Pen Interface
* Up to 1.6Mhz Disk Capacity
* Serial RS232 Interface
* Parallel Interface
* Numeric Keypad
* Definable Function Keys
* Cassette Interface
* 12" Monitor Included

from £1495

Quantum System 2000



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* Fully Expandable
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Two-Drive Quantum £1910

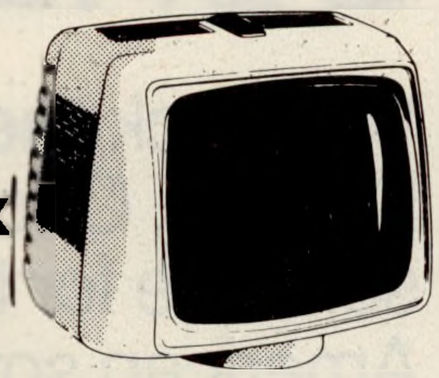
Gemini Multinet

The Gemini Multinet enables as many people as possible to have access to their own microcomputer with mass storage and printer facilities for the lowest possible cost. This is achieved by providing a central 'fileserver' fitted with a Winchester hard disk unit and printer interfaces, in conjunction with a method of interconnecting up to thirty-one workstations to the fileserver. The fileserver and each station are fitted with the Gemini GM836 network interface board. A Micropolis 800K floppy disk drive is incorporated in the fileserver providing backup for the hard disk.

GM910 Galaxy 4 Multinet 5.4 M/byte fileserver	£2600
GM912 Galaxy 4 Multinet 10.8 M/byte fileserver	£2850
GM909 Galaxy 4 Multinet workstation	£650

Both fileservers and workstations are supplied complete with VDU's; the operating software is supplied with the fileserver.

Phoenix P12 Monitor



A high quality 12" data display monitor, ideal for Gemini systems. The P12 is available in both green and amber phosphor versions and has a resolution of 20Mhz.

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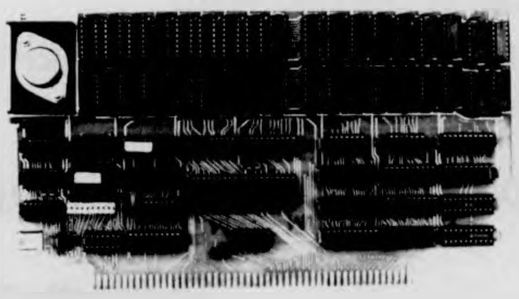

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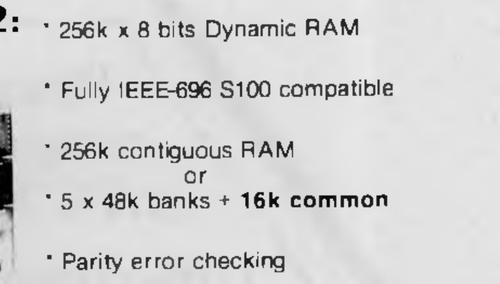

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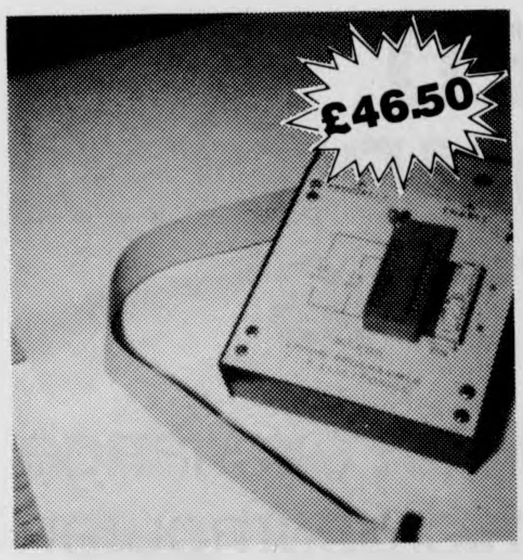

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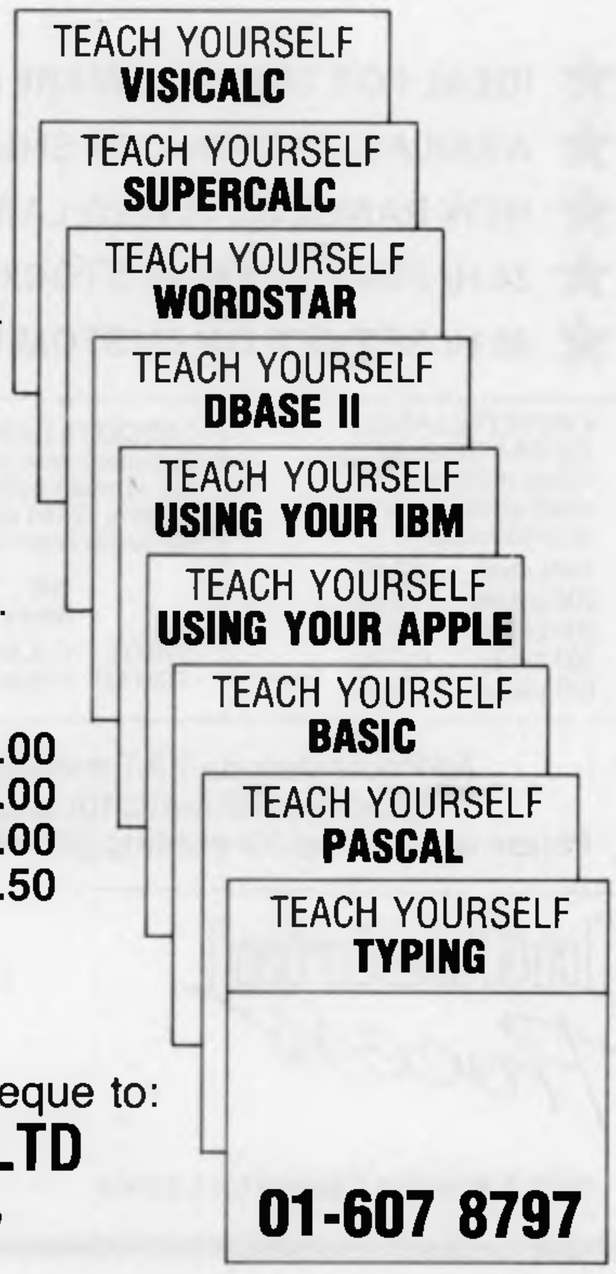

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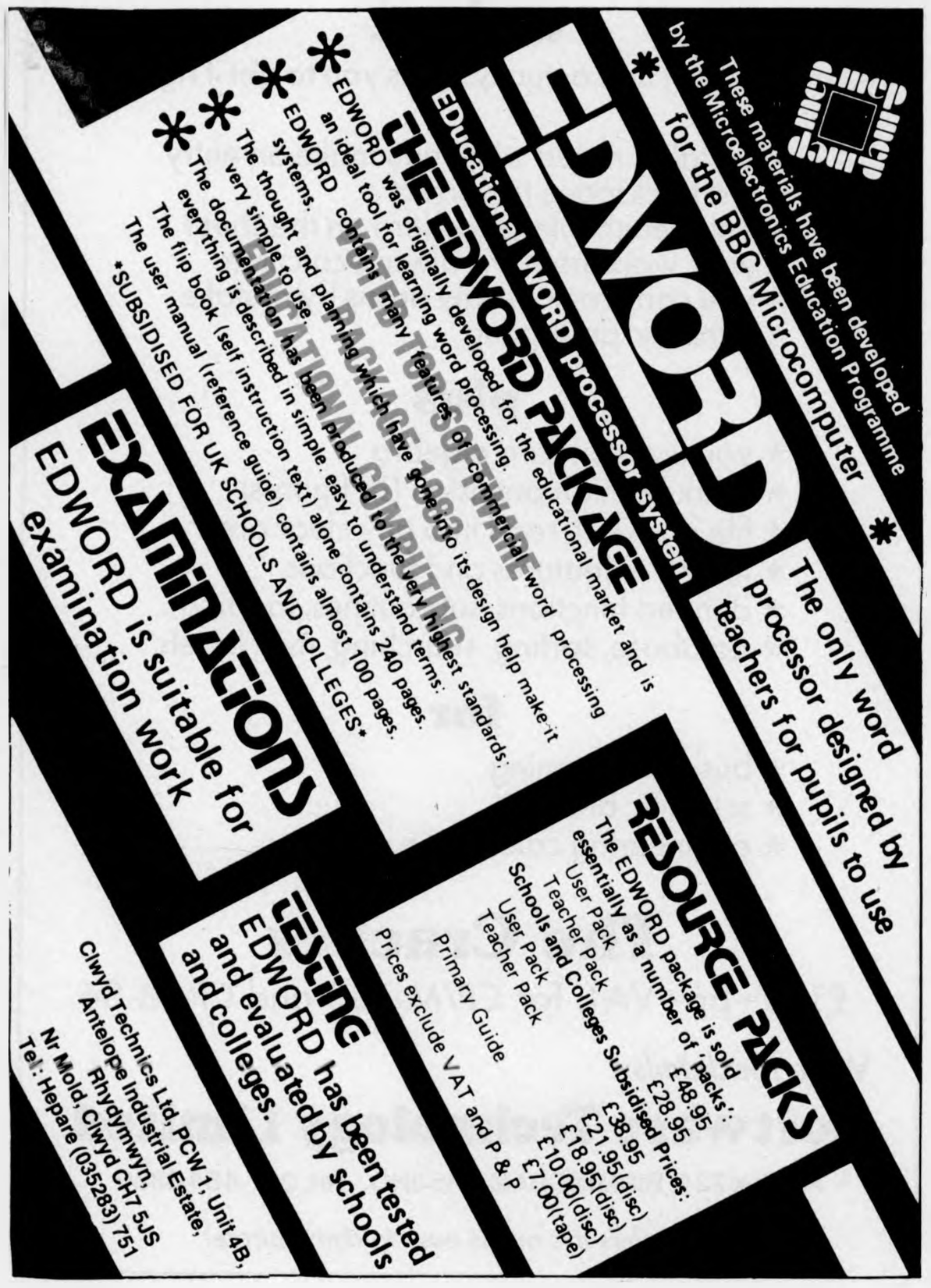

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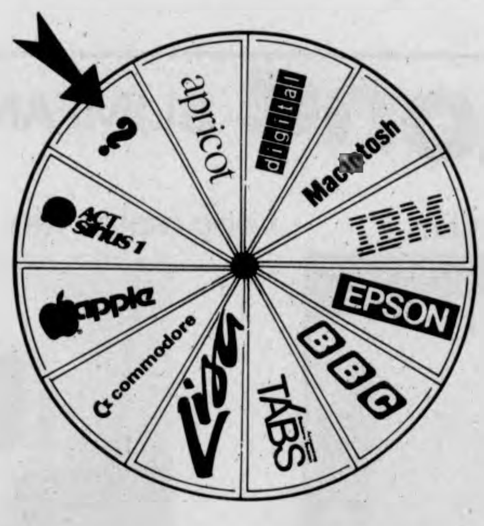

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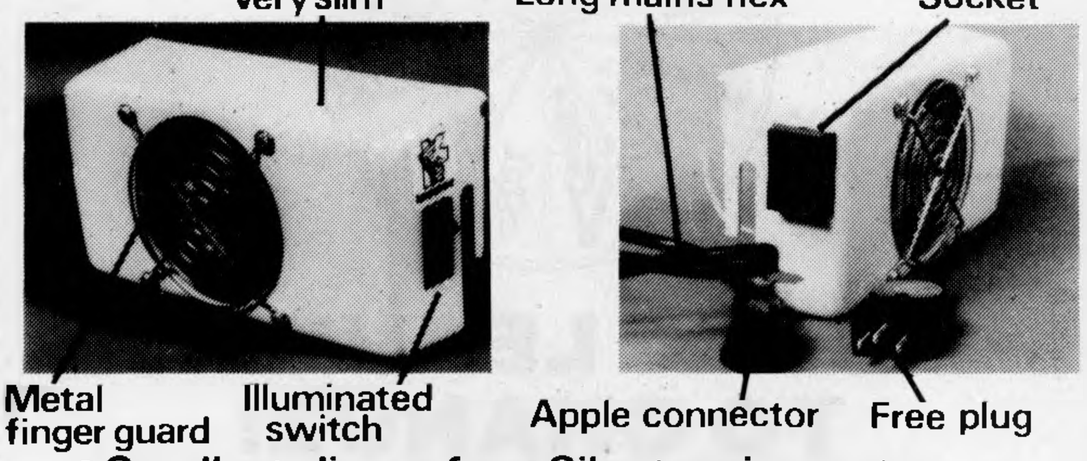

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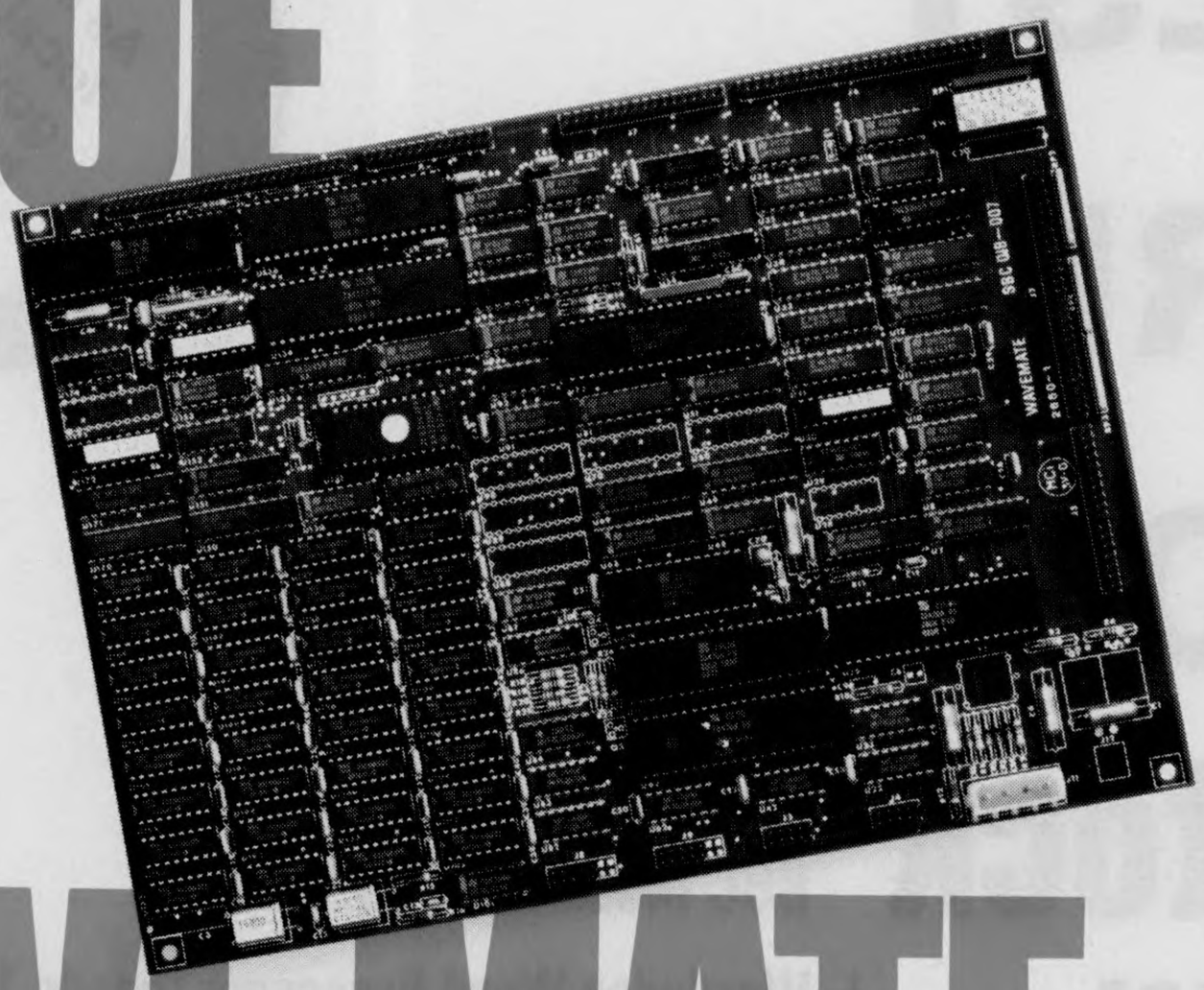

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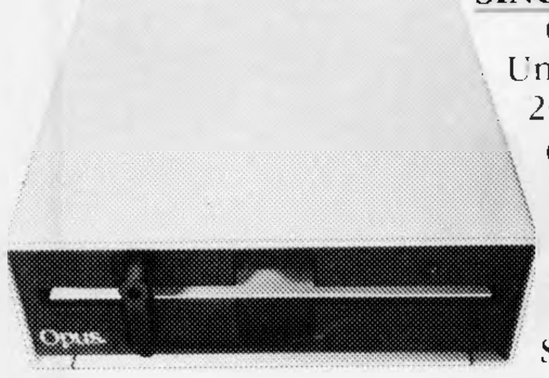

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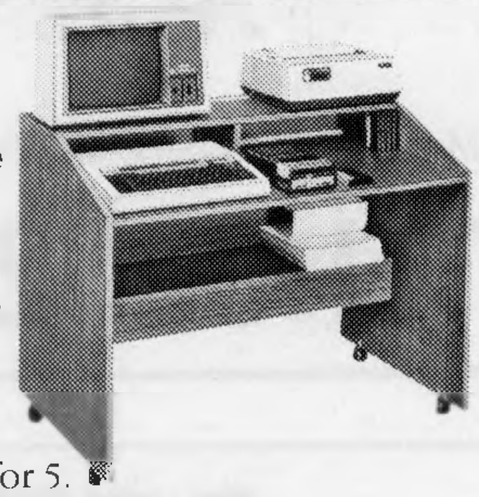

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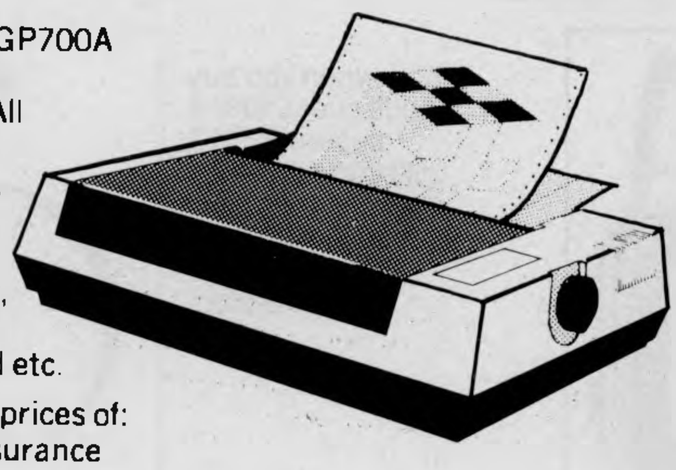

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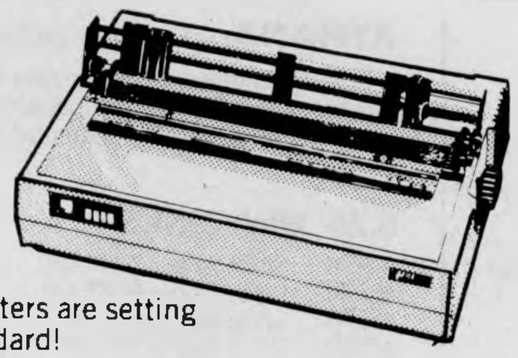

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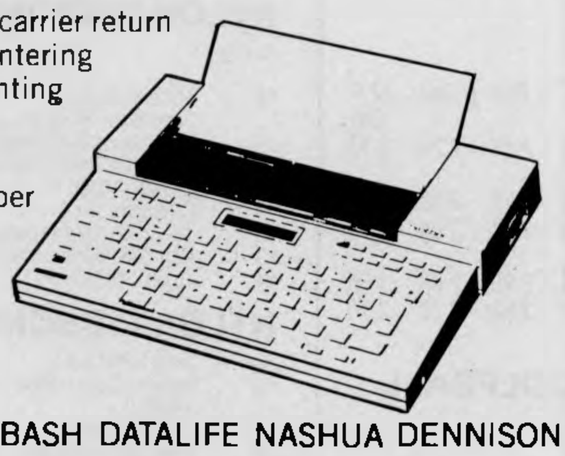

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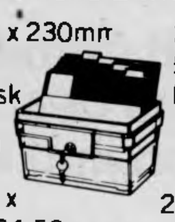

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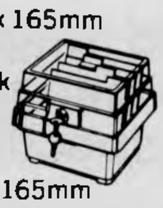

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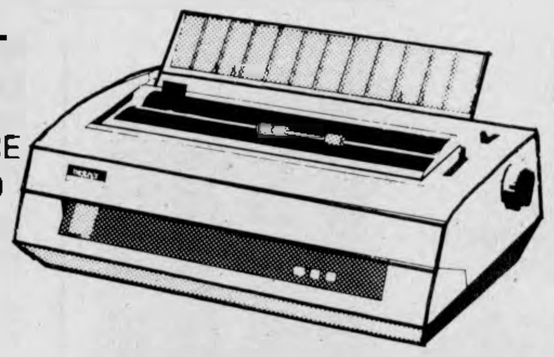

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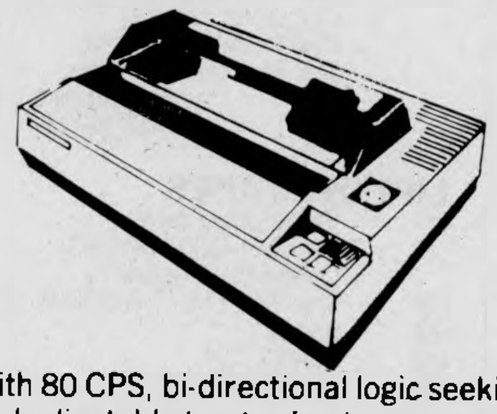

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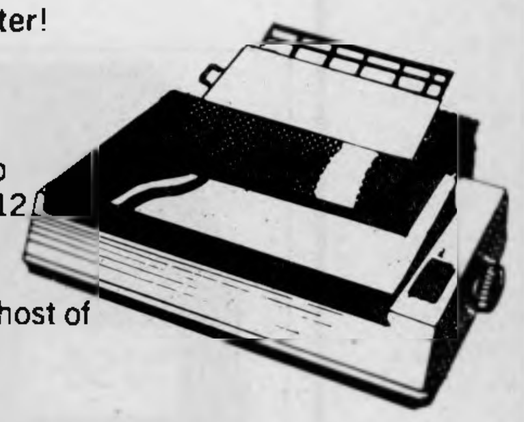

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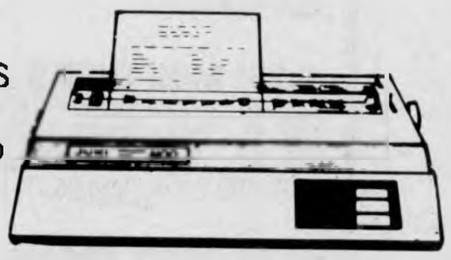

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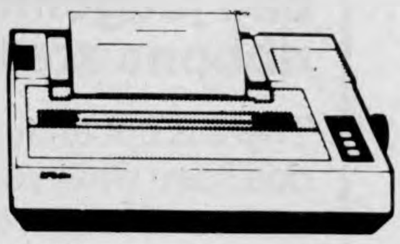

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572 SC	Olivetti ET201/221/231 Silver ReedEX55	2.40	2.04	1.94	1.84
571	Olympia ES100	2.80	2.20	2.08	1.96
675 SC	Xerox 610/615/620/625/627	2.87	2.33	2.22	2.10

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563 SC	IBM Selectric, Addo, Adler, Facit, Hermes, Imperial, Olympia, Remington, Royal, Siver Reed, Triumph, Brother (yellow) standard	1.66	1.42	1.30	1.18
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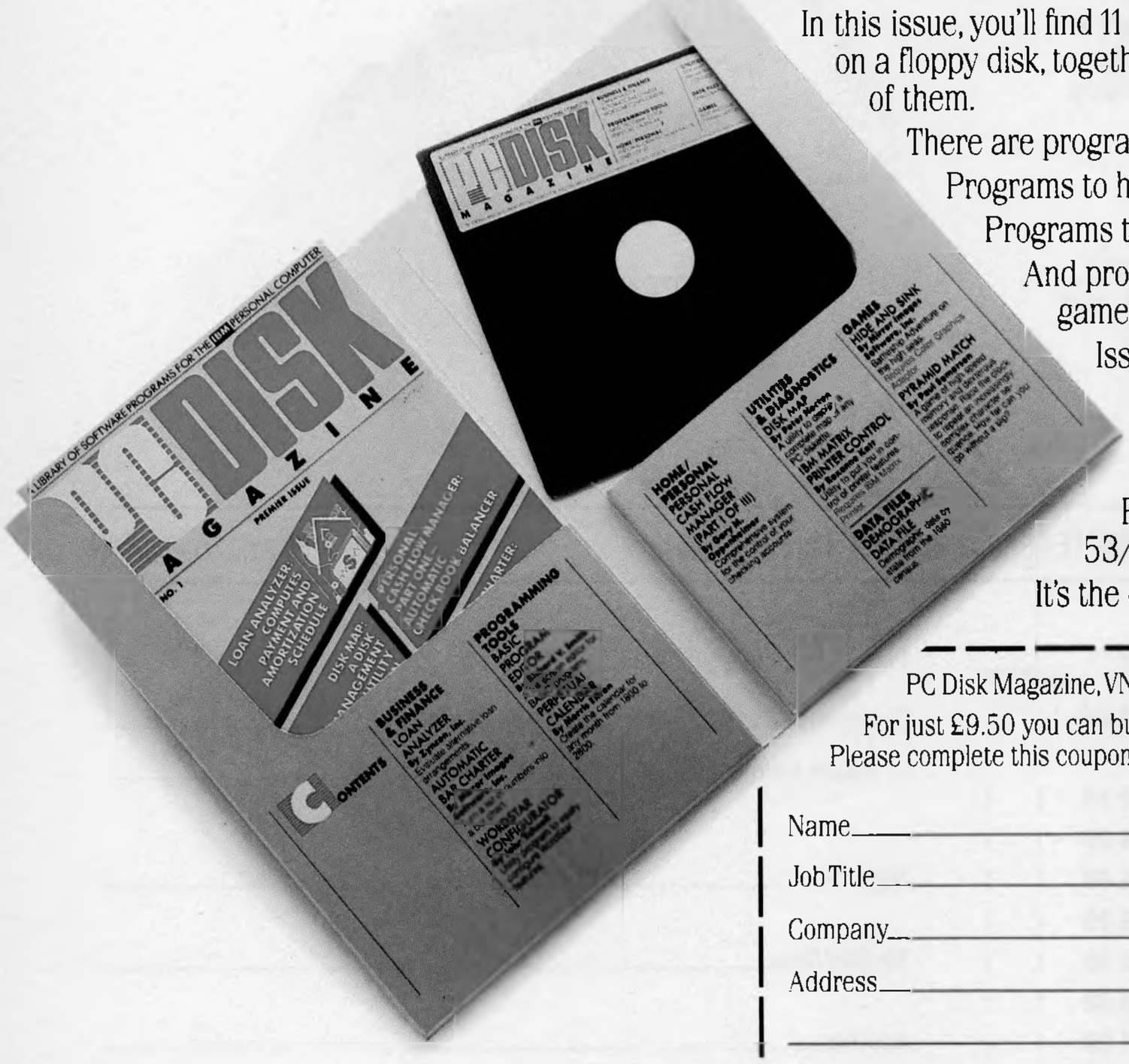

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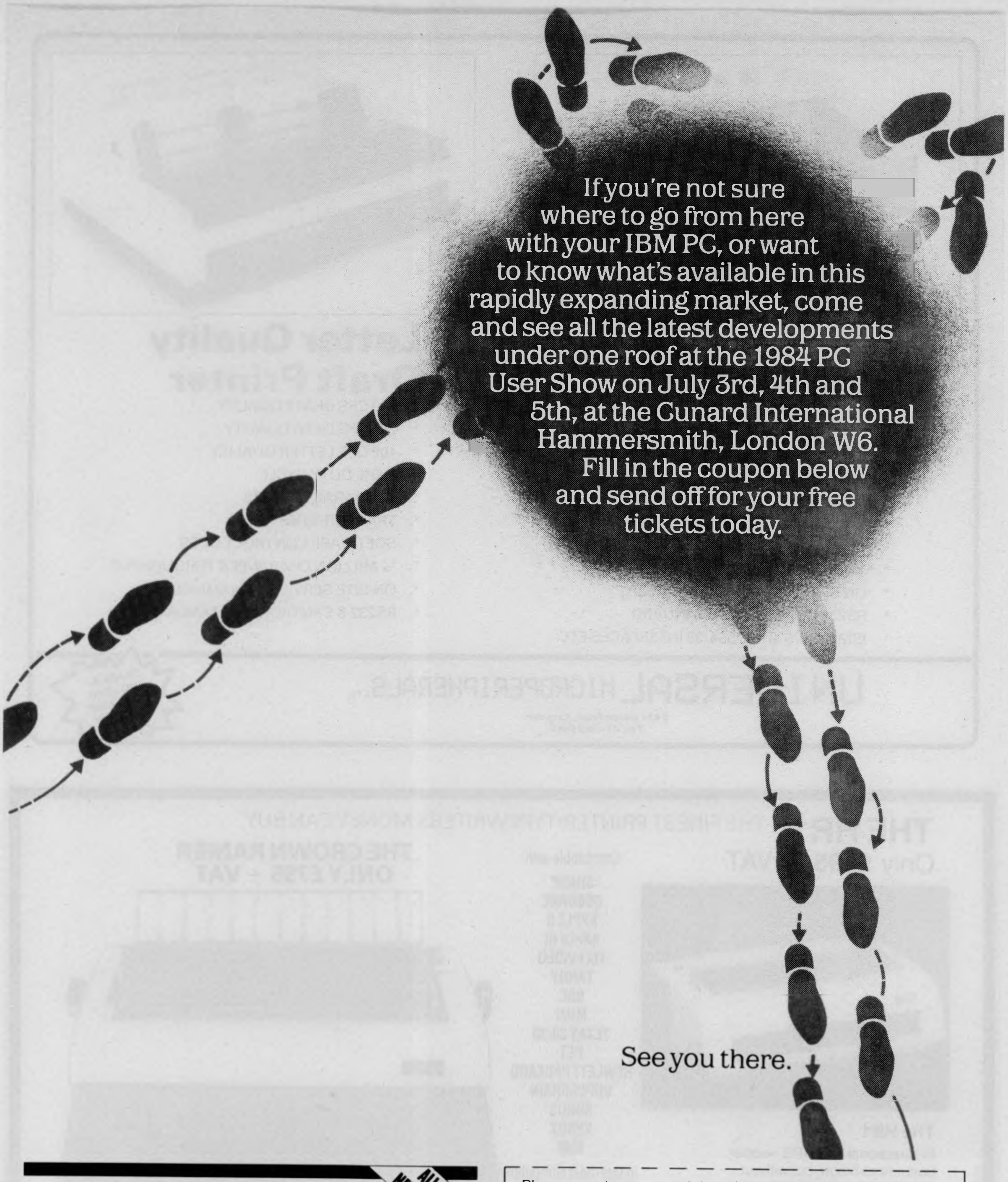

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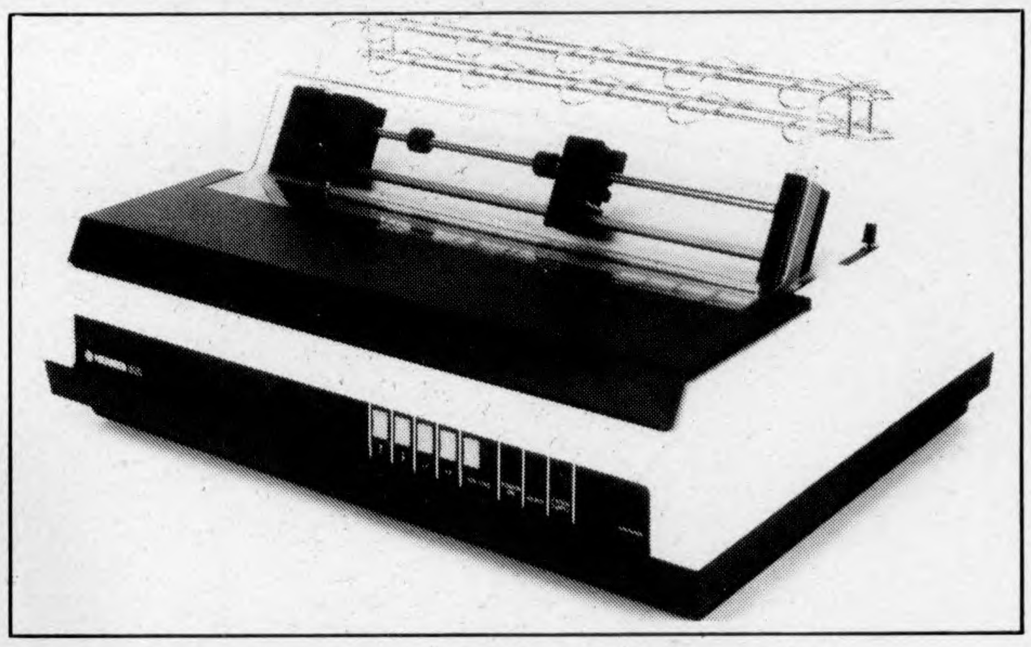

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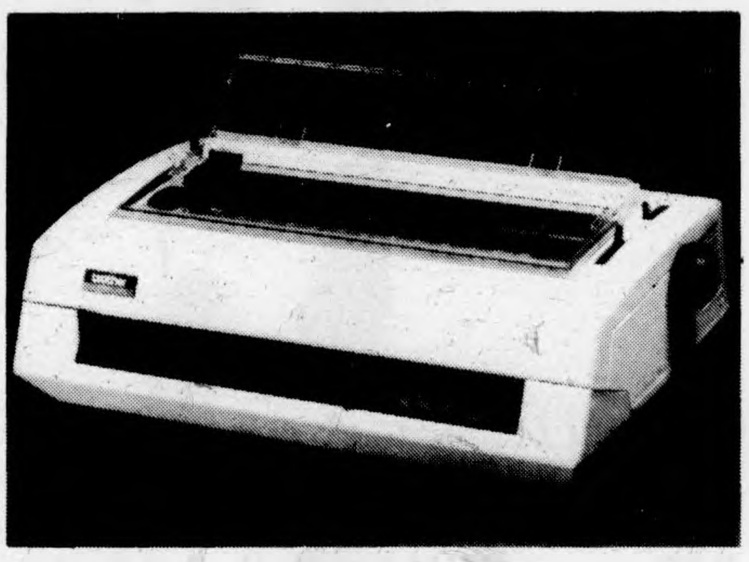

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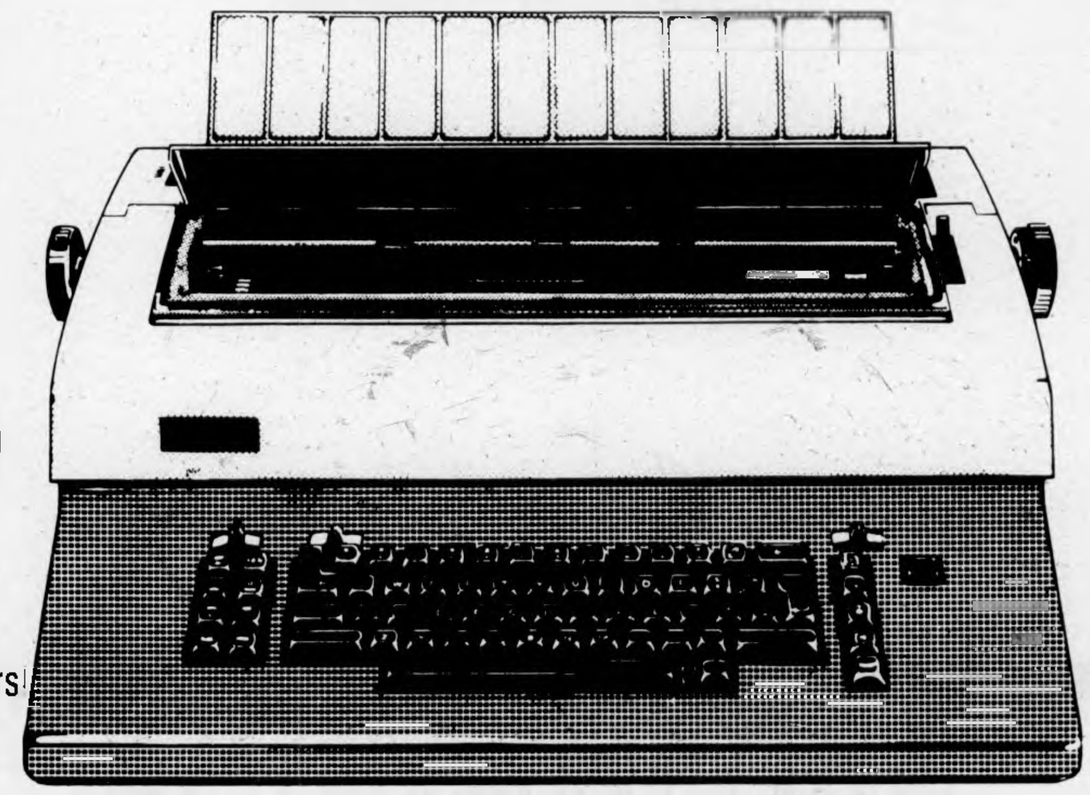

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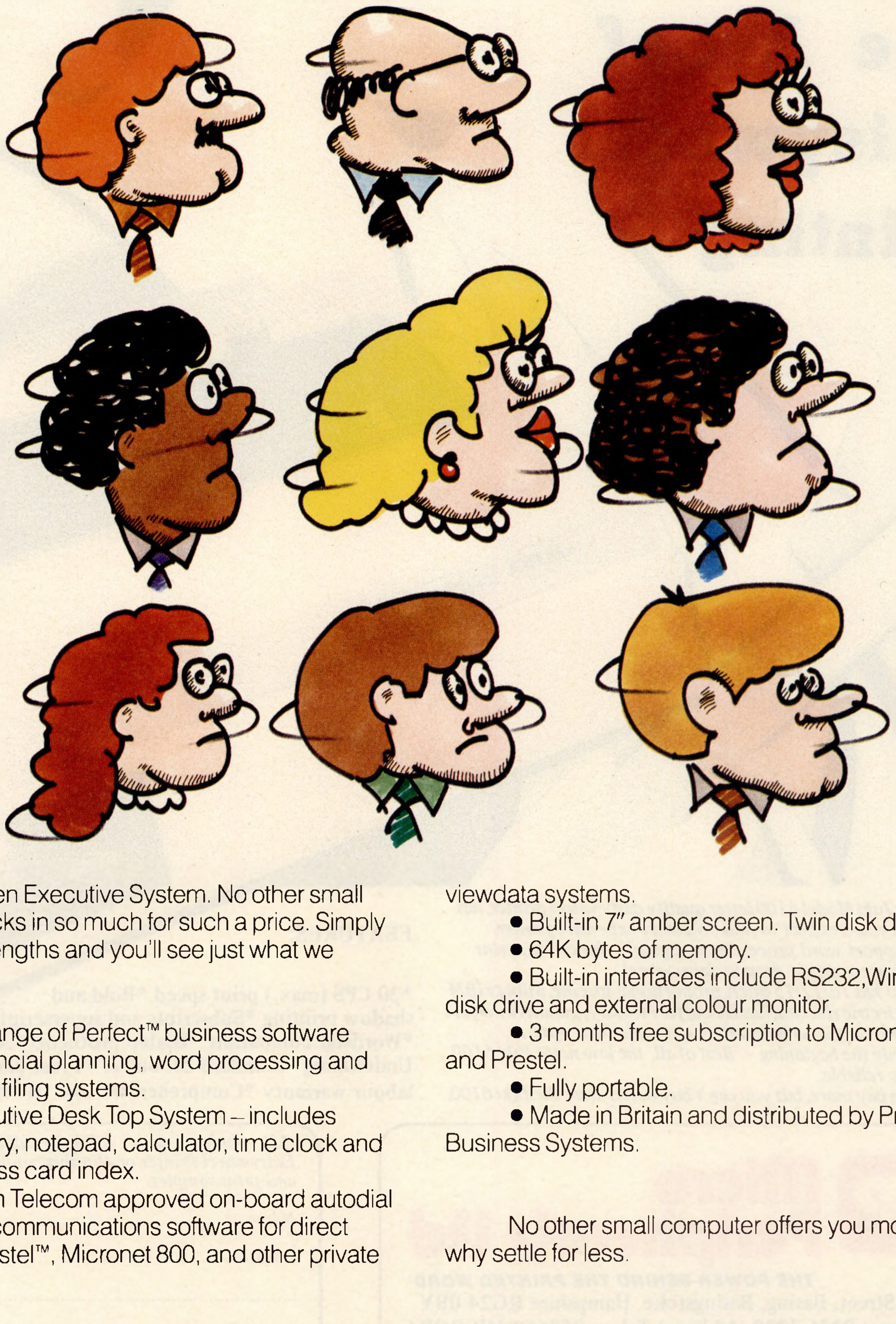

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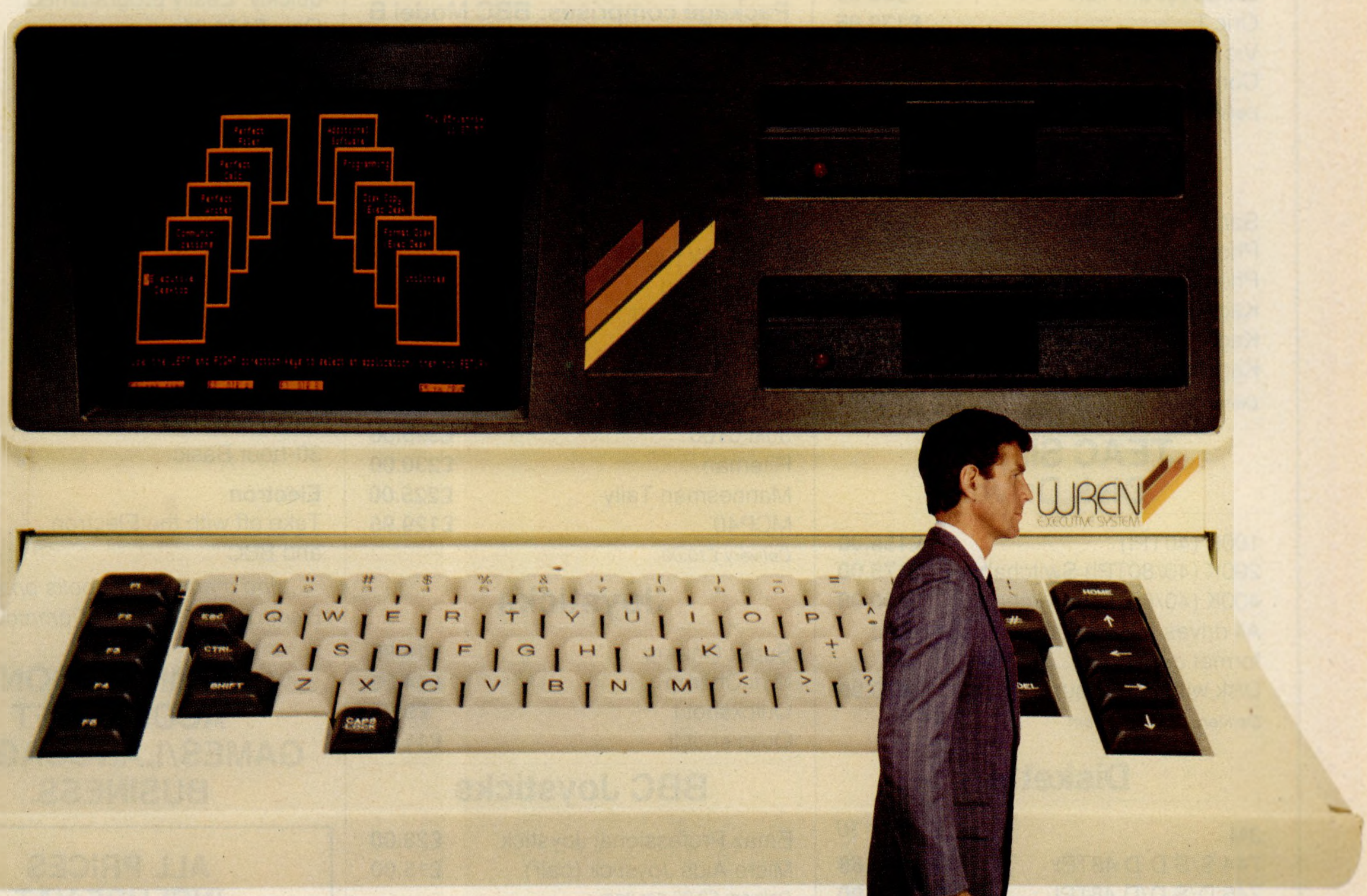

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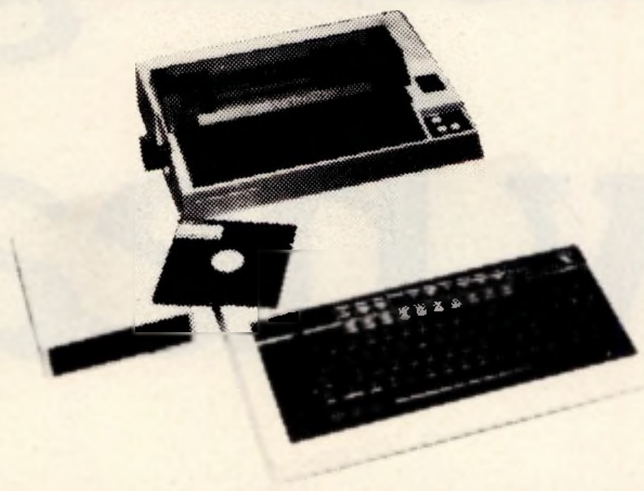

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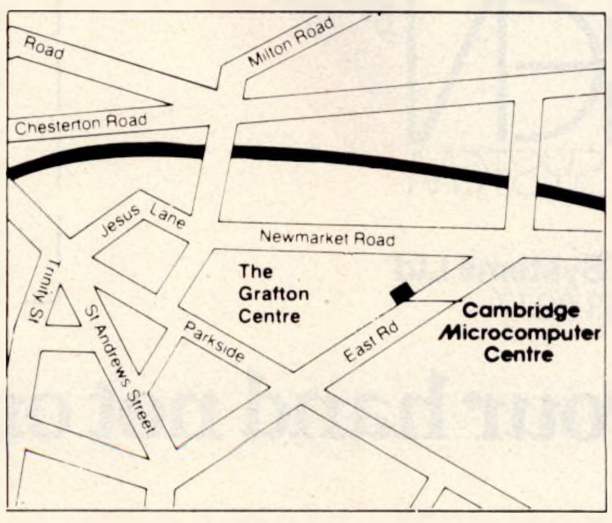



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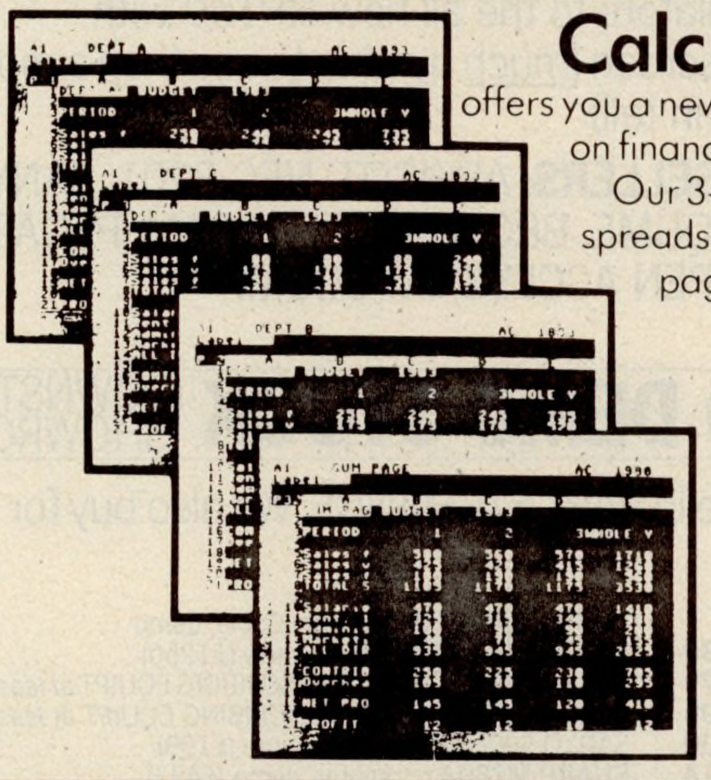

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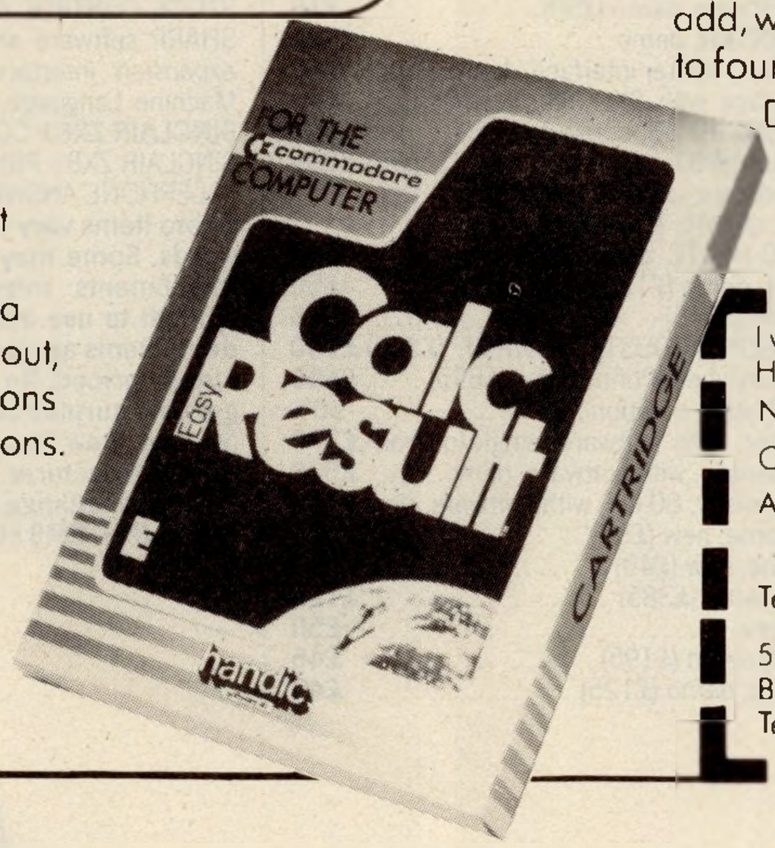

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PCW323

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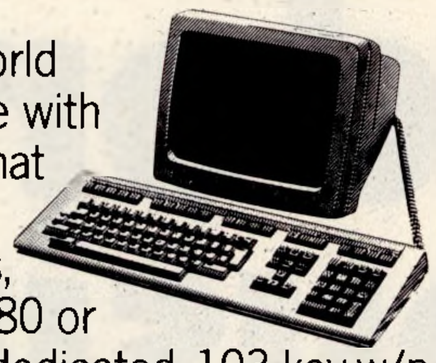

DIGITAL EQUIPMENT CORP. (world no.2 computer manufacturer) have with their RAINBOW 100 a computer that replaces three normal machines. It runs both 8 and 16-bit programs, automatically selecting either its Z80 or 8088 processor. It's also got a full, dedicated, 103-key w/p keyboard. Just add the word-processing software. Morse price on the Rainbow 100 (list £2767) is £1995.

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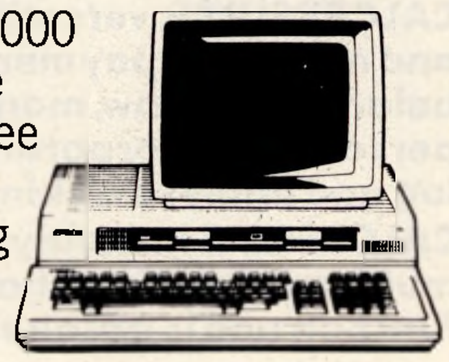
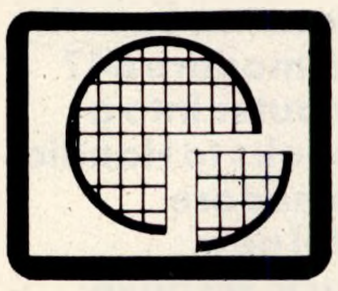


EPSON QX10, another below-£2000 system - and that includes a large "bundle" of the excellent Peachtree software and the Epson RX80 printer. The QX10 has an amazing capability to display (and print) a variety of type styles and sizes.

KAYPRO is the machine that has swept the US market. Of course it is an exceptionally ugly device which you'll probably hate at first glance. But once your fingers stray over the man-size, positive-action keyboard, and you treat your eyes to the large, steady green-phosphor display, you'll see the solid virtues of this bomb-proof portable. Complete with word-processing, spreadsheet and assorted software items; Morse prices from £1200.

TELEVIDEO. This manufacturer got big by dominating the mainframe VDU market. In a quiet way, Televideo are now easing their way to the top of the microcomputer charts. The new Model 1605 is a big-screen IBM-compatible that also runs IBM-format graphics. The acid test in the trade is to load the Lotus 1-2-3 Graph disk, or the Microsoft Flight Simulator. Both of these run straight out of the box on the 1605. Also at Morse: Televideo TPC-1 portable & 803 full-size, both bundled with plenty of applications software including Digital Research GSX80 graphics package.



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Technically Speaking: what is DIMENSION

The new DIMENSION is a true multi-user, multi-processing system which will support up to 12 users. It will run off-the-shelf software and hardware add-ons developed for the IBM-PC and XT. Users can be added without any performance degradation enabling them to share software and expensive peripherals.

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- ★ a time of day clock
- ★ two serial and one parallel port
- ★ additional serial port at each workstation
- ★ data security through key lock and log-on passwords
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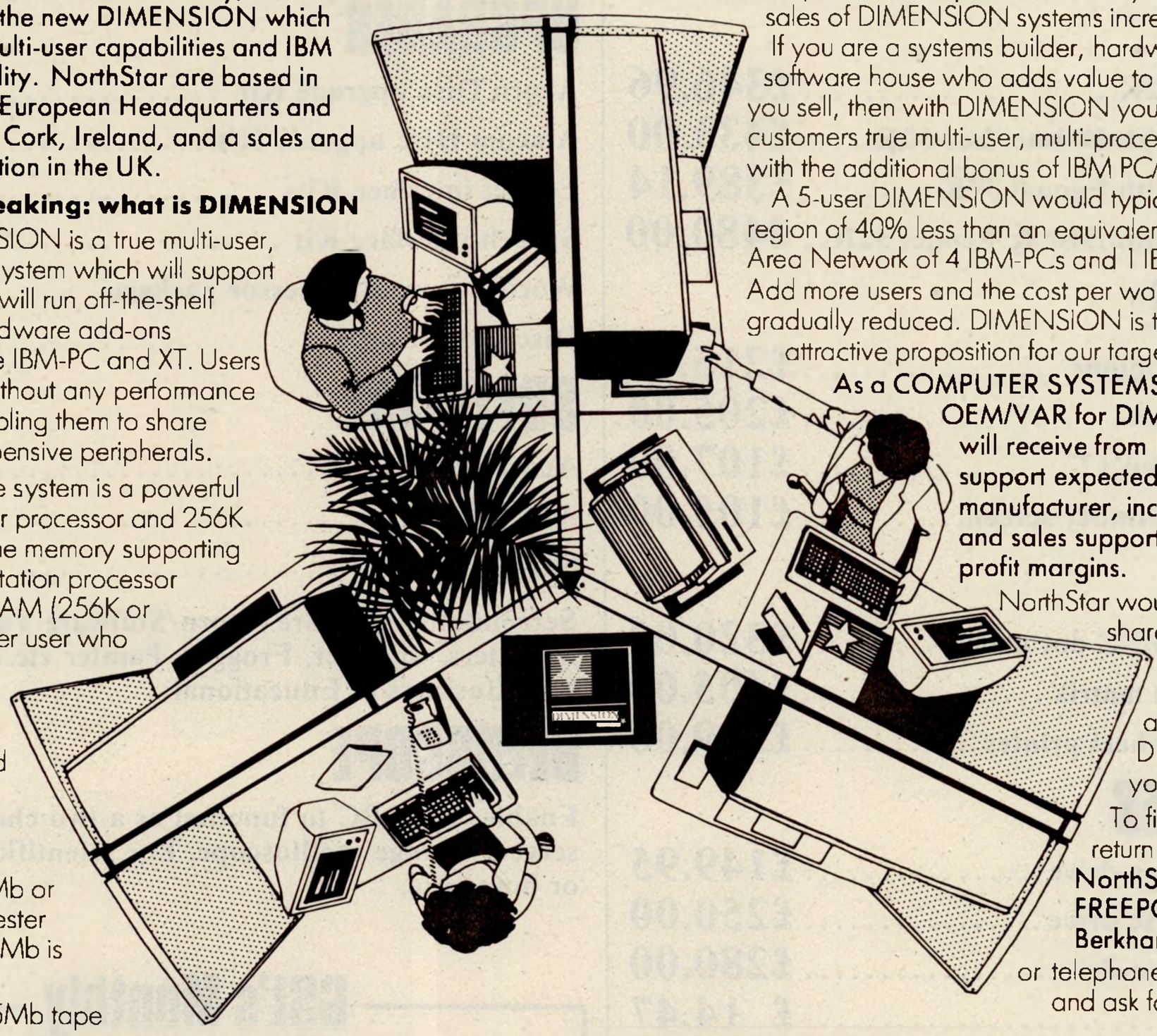

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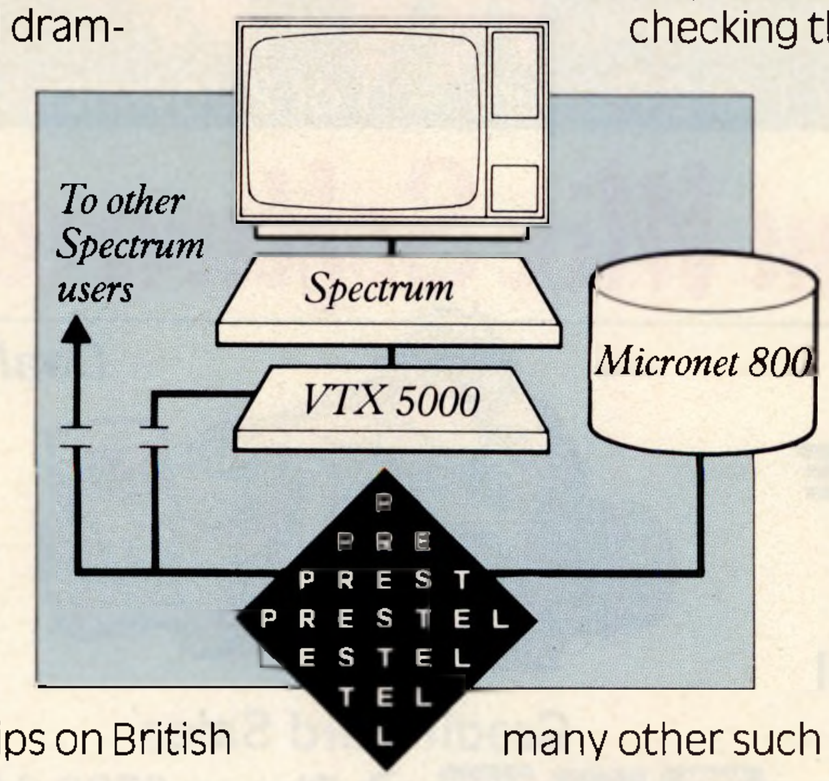

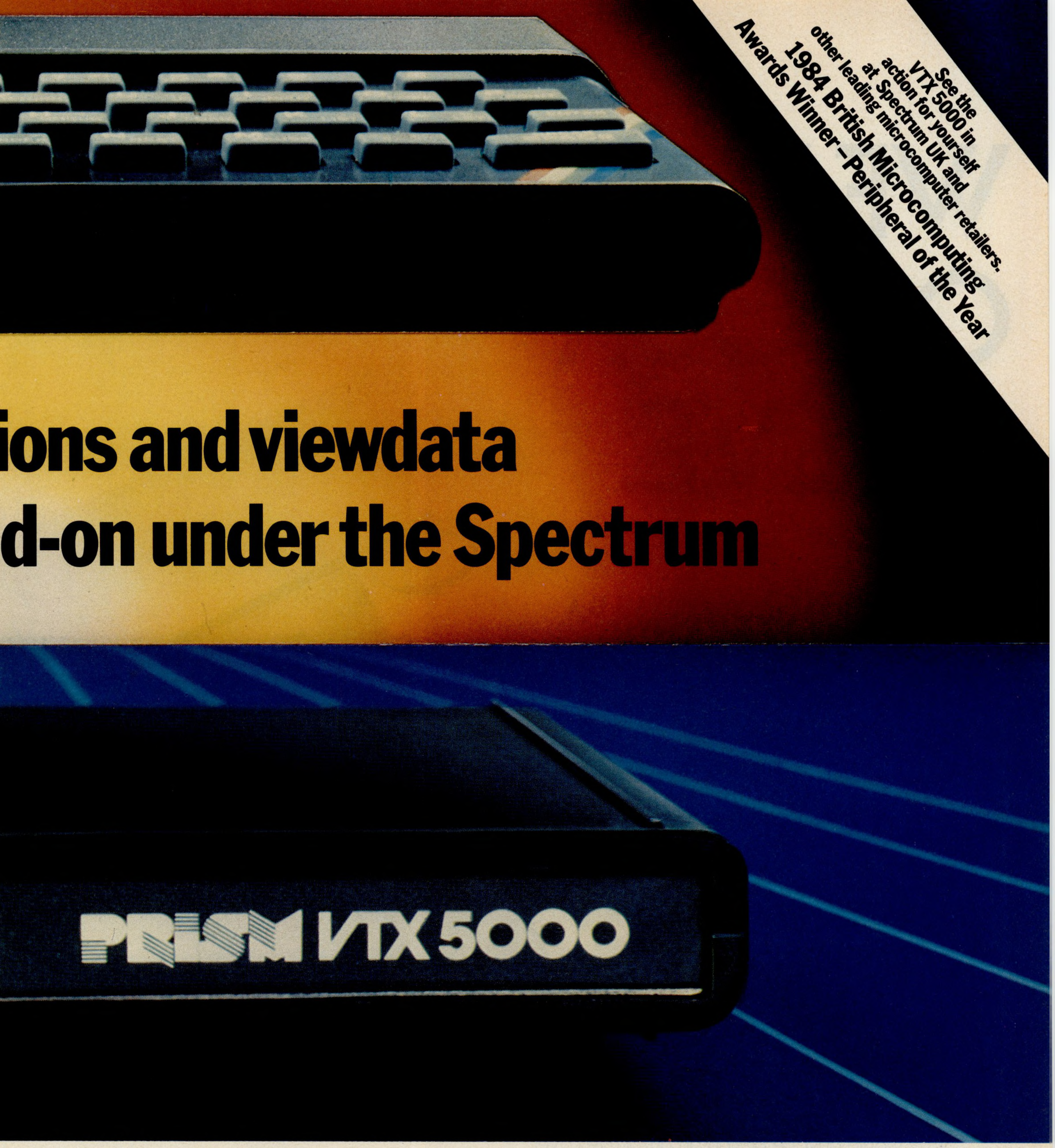

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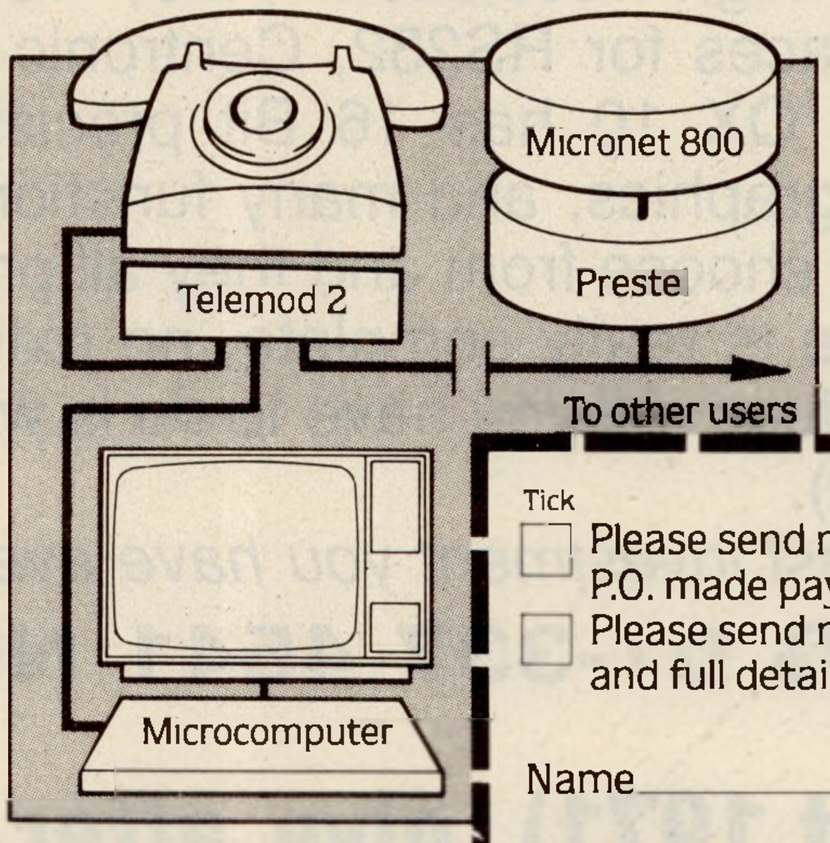

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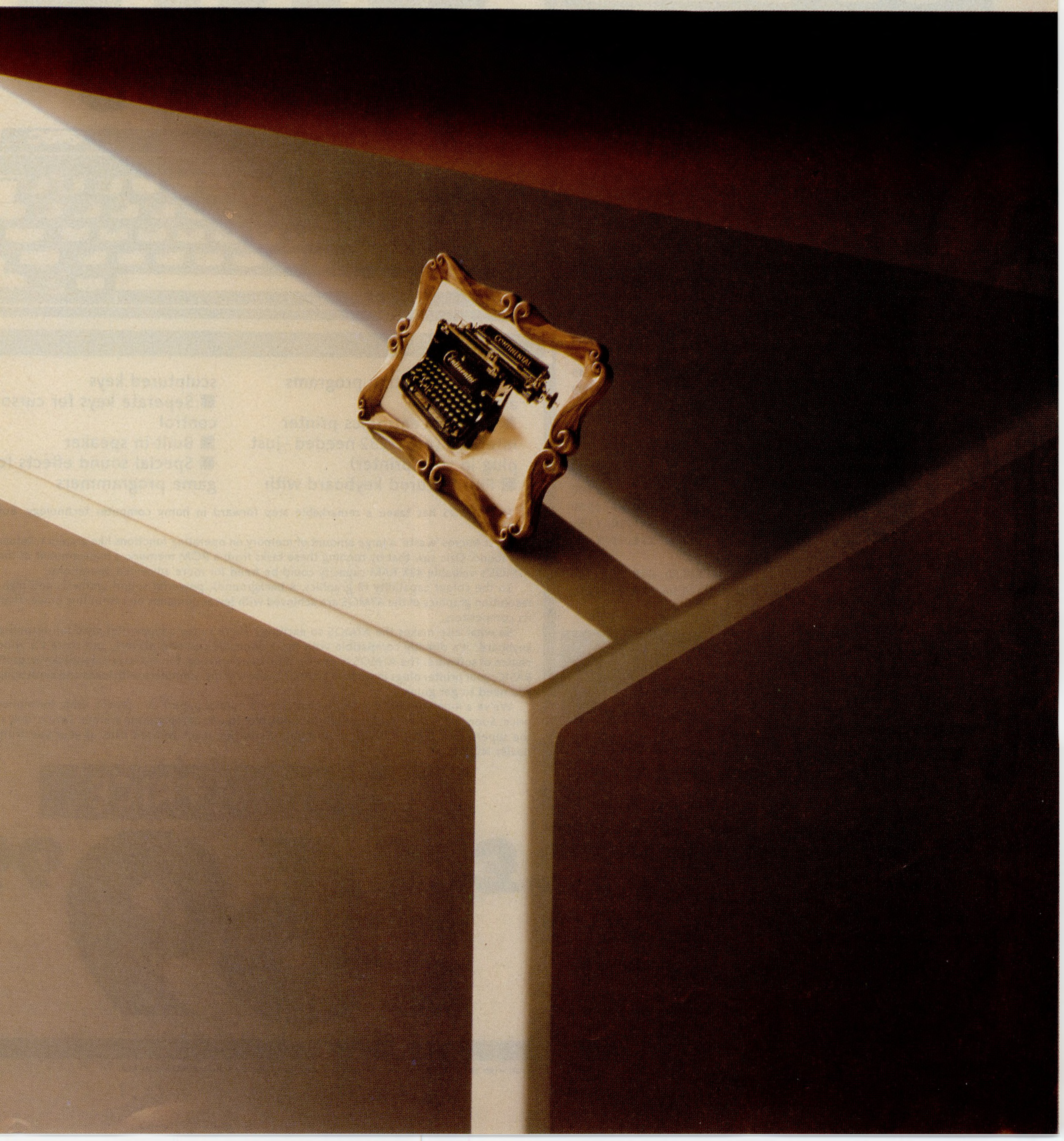

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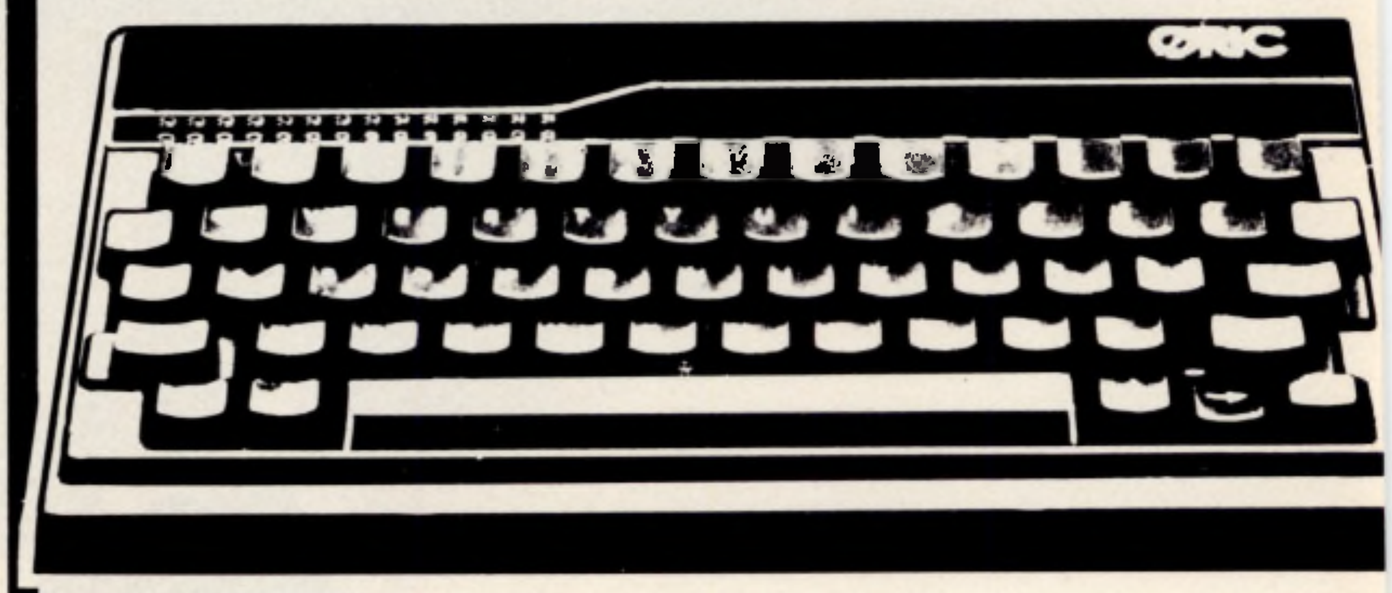

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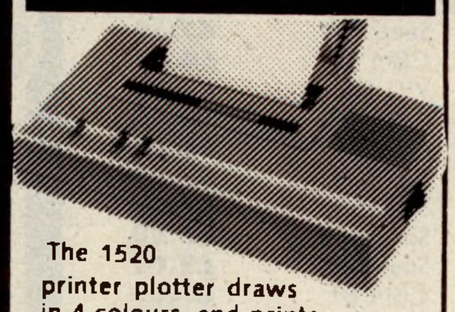
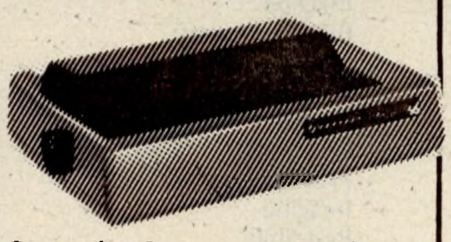


The 1520 printer plotter draws in 4 colours, and prints characters and numbers.

£99.99

COMMODORE 1526 PRINTER



Superb Dot Matrix (near letter quality printer)

£345.00

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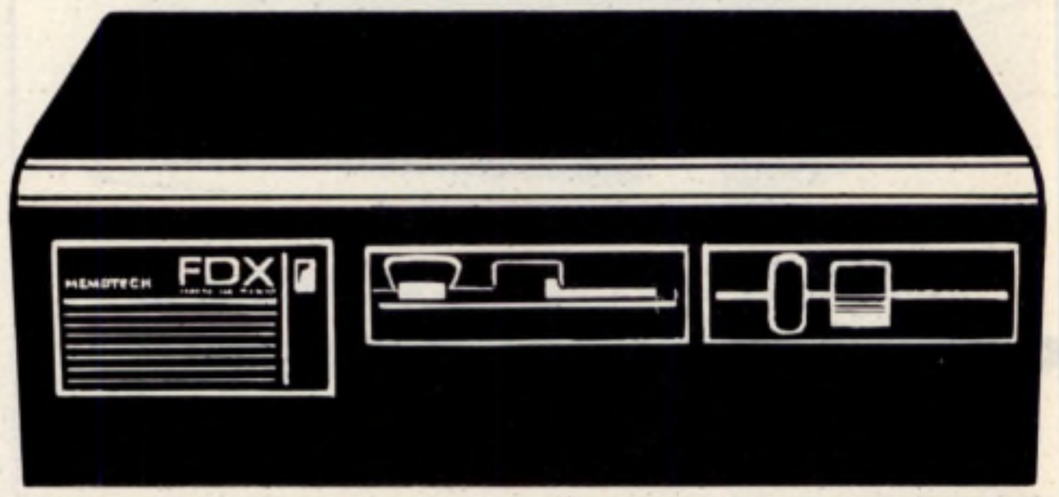

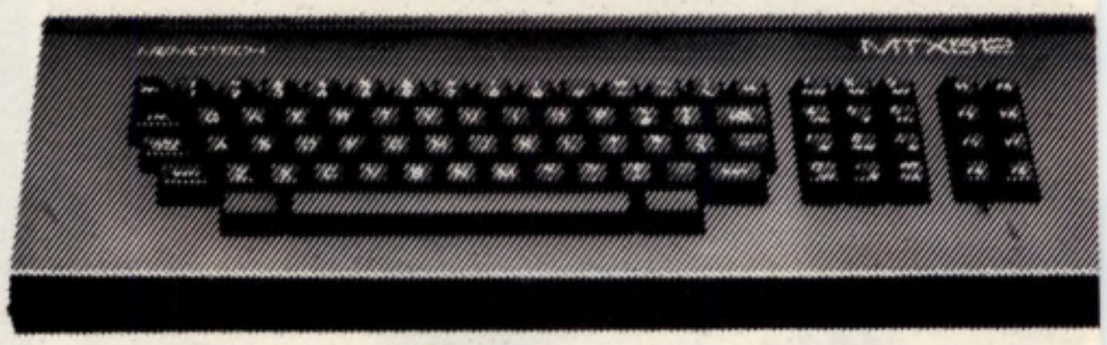

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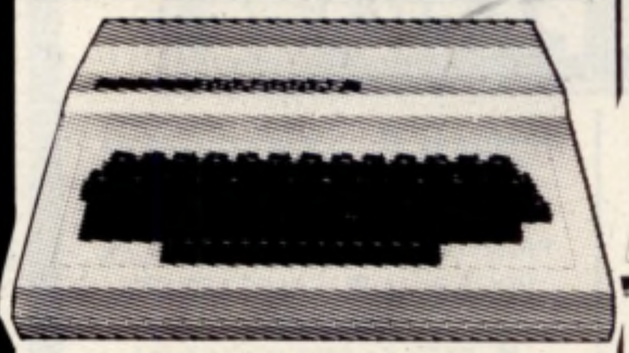

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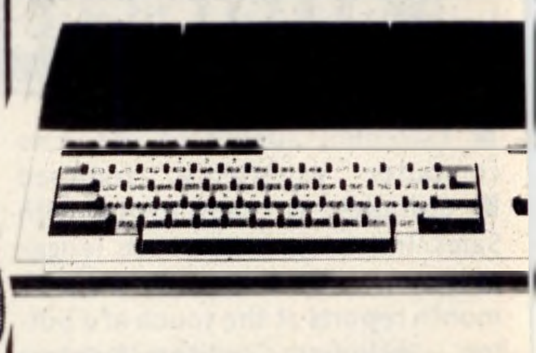

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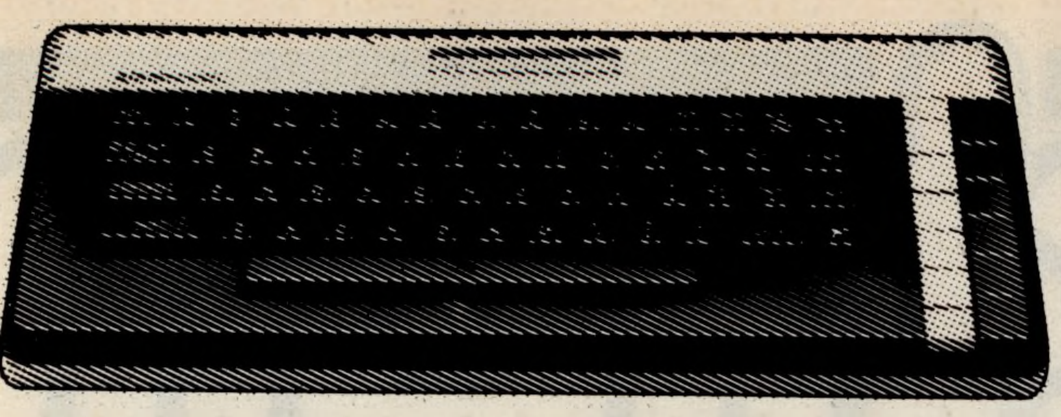

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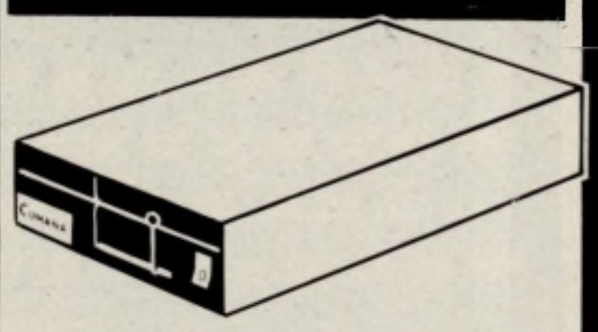

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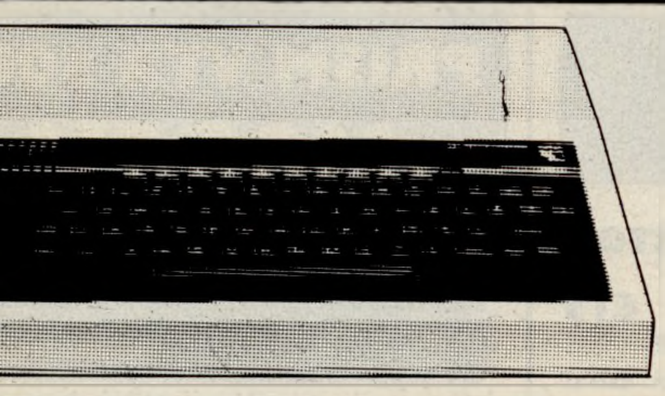

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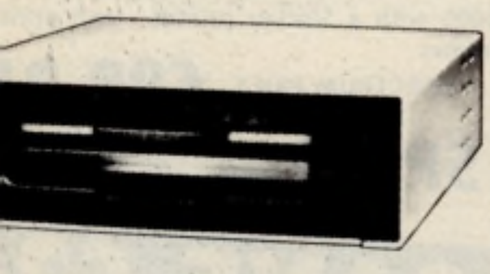

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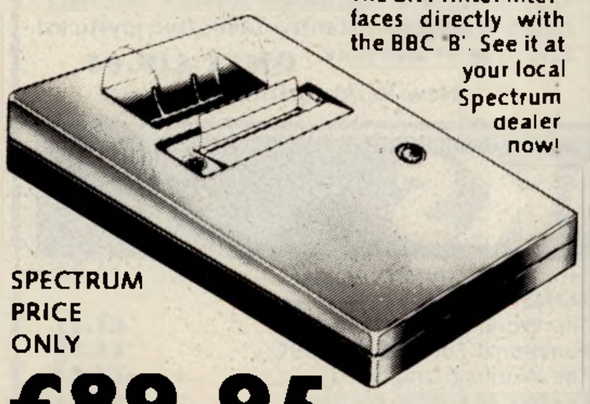

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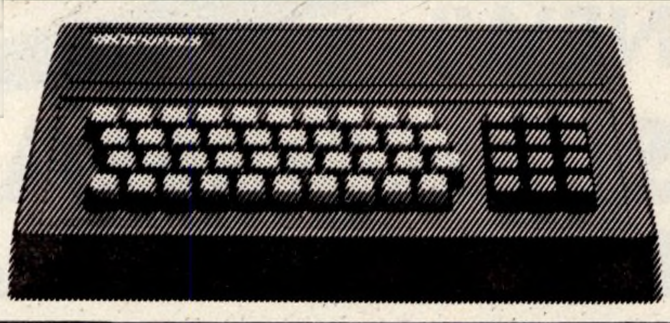

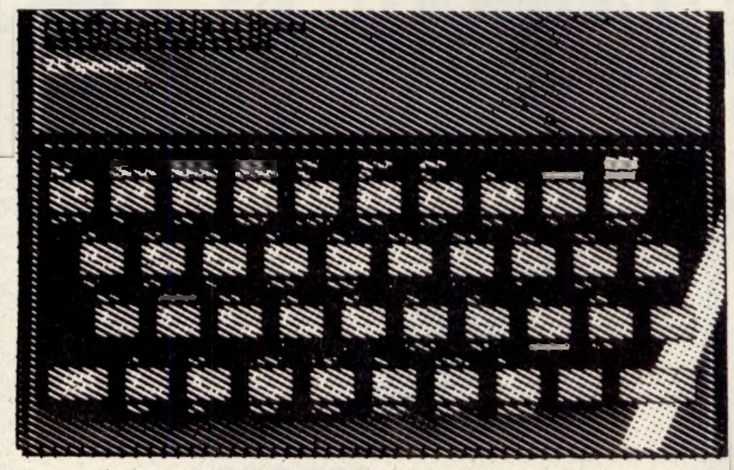

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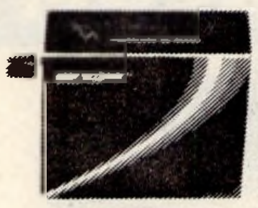

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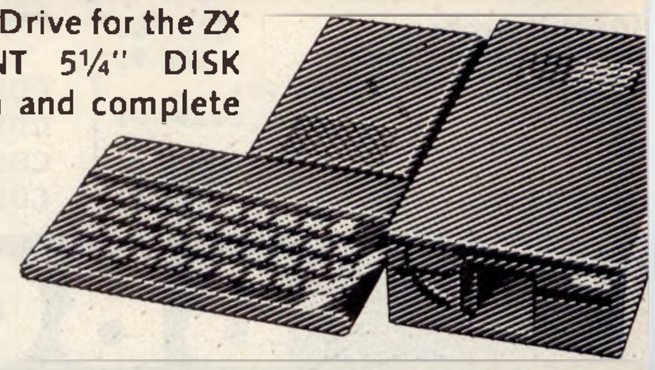

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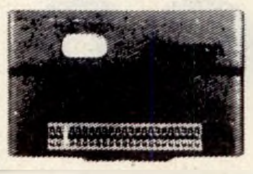

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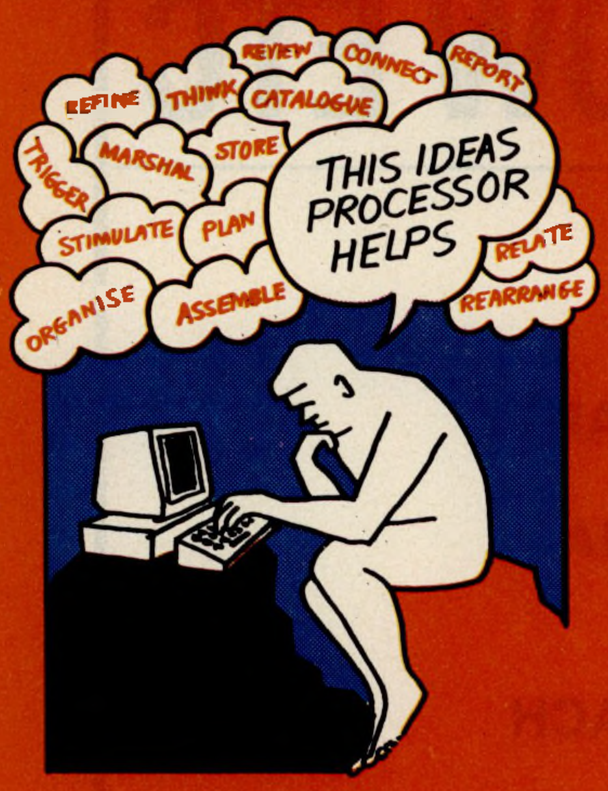



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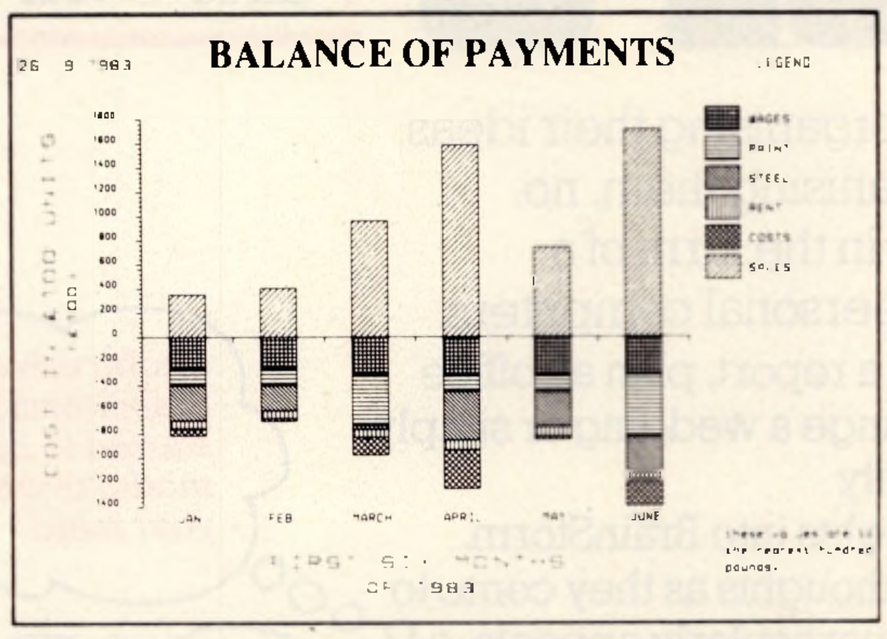

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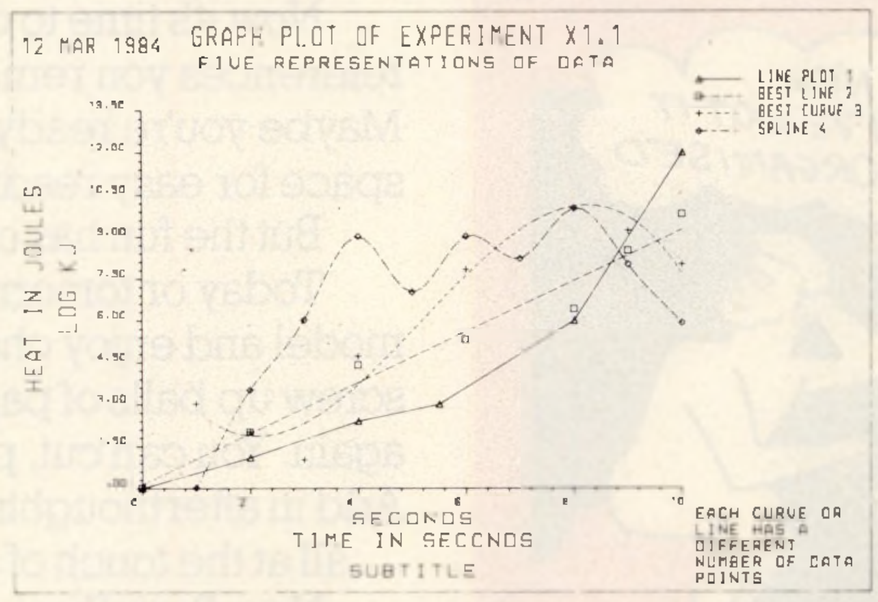

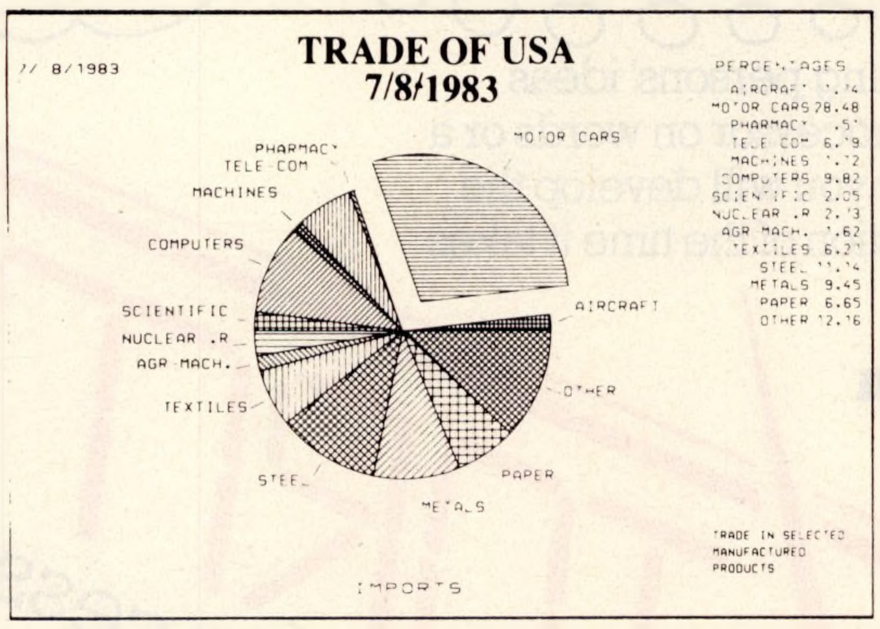

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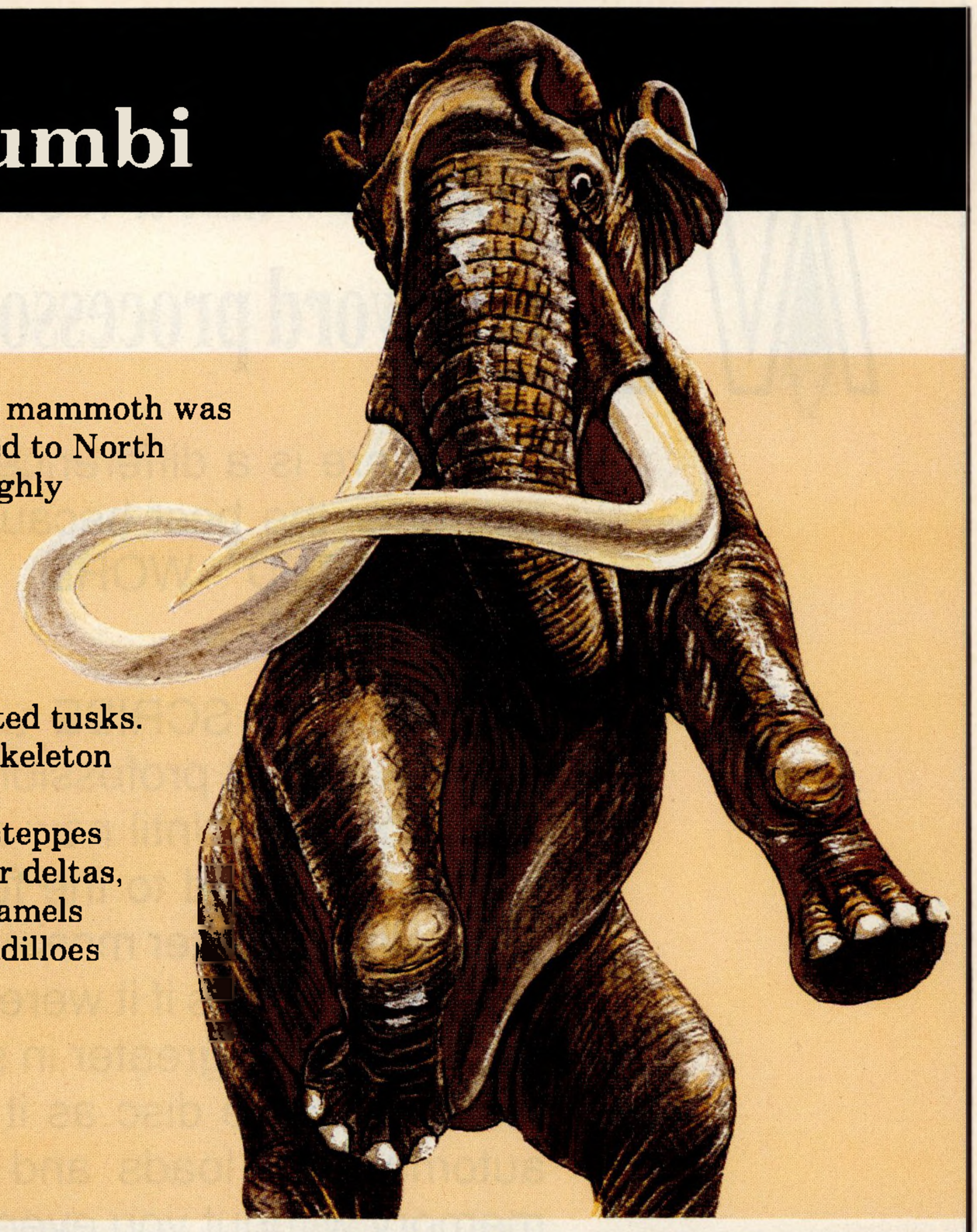
Access

Mammuthus Columbi

Circa 60,000 BC



Like the emperor mammoth, the Columbian mammoth was also a descendant of mammoths which immigrated to North America during the Irvingtonian time (which roughly approximates to the Holstein interglacial in Europe). It inhabited the south-eastern part of the USA (South Carolina, Georgia, Louisiana) and may have extended still further south into Mexico.

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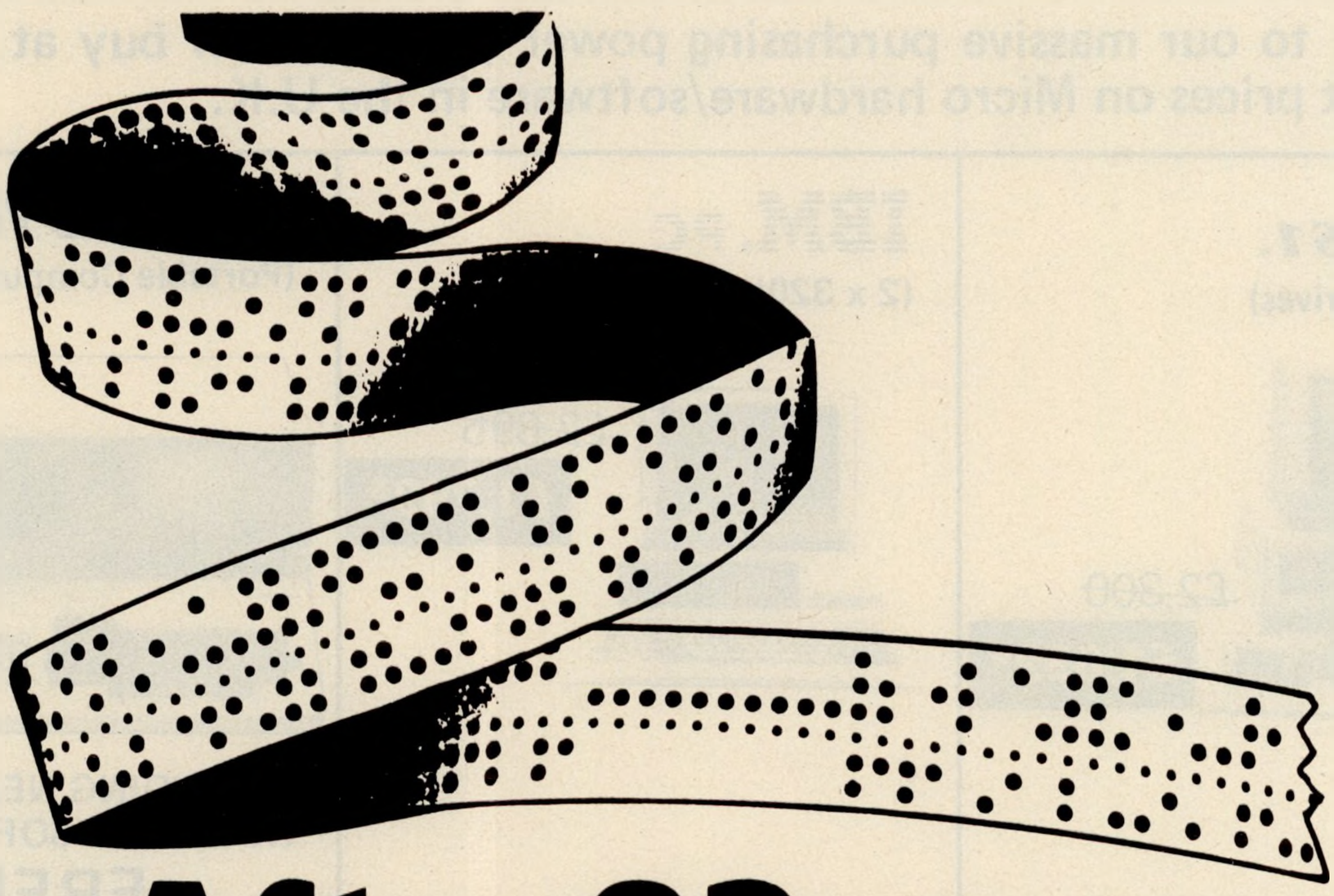

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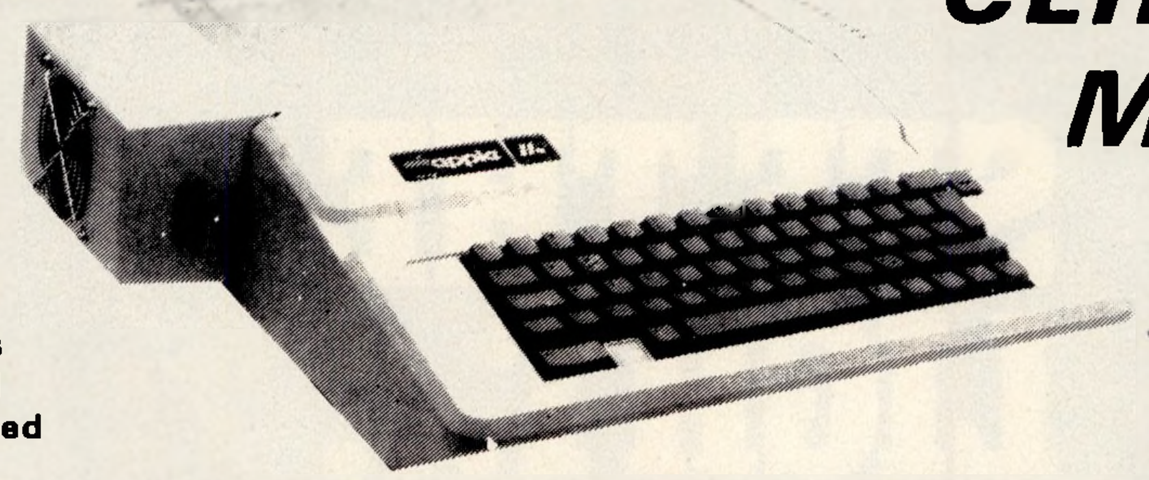

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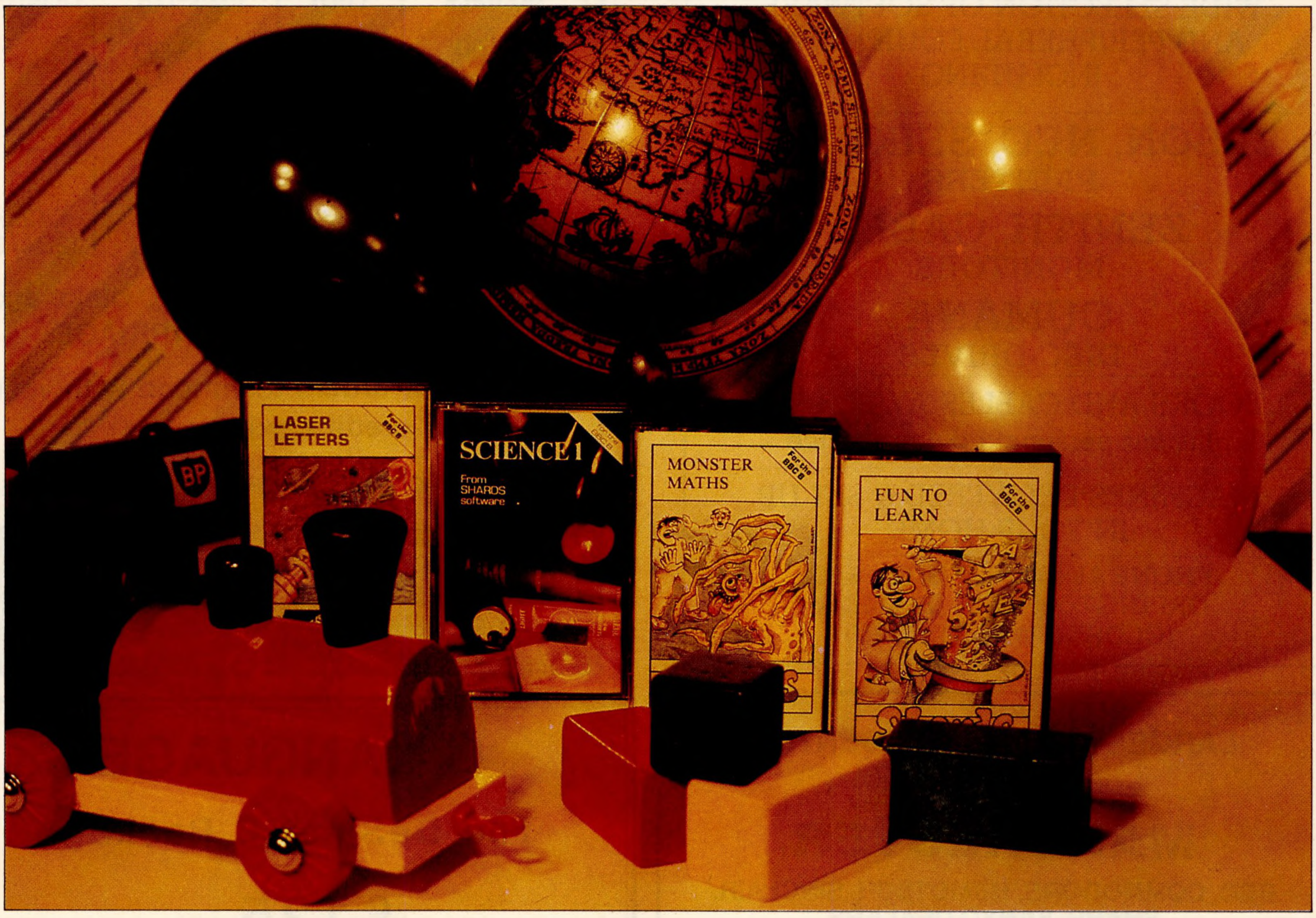

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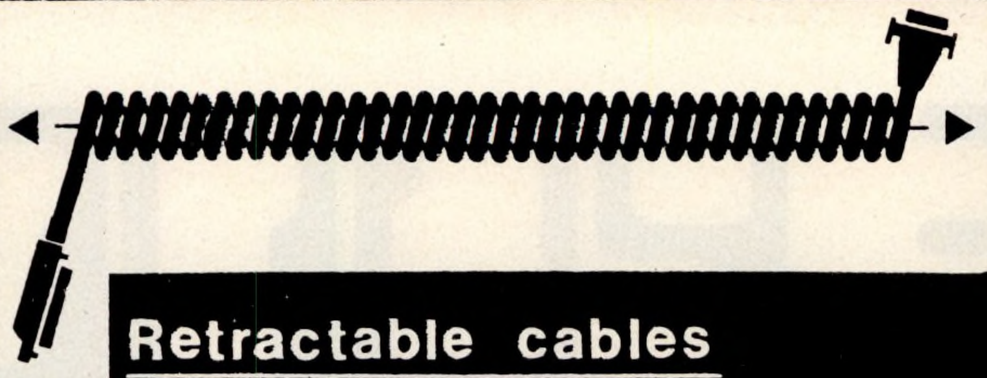

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CHIP CHAT

Quote of the month from Nigel Searle, Sinclair Research's managing director, on Radio 4's Chip Shop programme: 'People who waited a year to buy their Spectrum got a better machine.' 'nuff said.

★ ★ ★

Mr Slade of Gloucestershire phoned. 'I'm thinking of replacing my car,' he said. 'Where can I buy the computerised Daimler mentioned in March's ChipChat?' We told him, but not before asking what he did for a living. An international executive perhaps, or a Lord Mayor? Not exactly... Mr Slade's an undertaker. What on (or rather, under) earth does he want the computers for?

★ ★ ★

Thousands of fans regard The Hobbit as 'the most exciting and challenging adventure available' — that's what Melbourne House says. In response to 'overwhelming demand from fans' it's now produced *A Guide to Playing The Hobbit*. The word is that typing 'Help' in any edition of the game purchased after April 84 will elicit the prompt: 'Buy the Guide, sucker!'

★ ★ ★

Future Computers on the rôle of an FX20 in the new Channel 4 drama series *Anything We Can Do*: 'See how schoolteacher Helen and husband John, a printer, react when computers come into their lives.' To say nothing of the kids. Real little characters, they are.

★ ★ ★

The Lovesong of J Alfred Sinclair could be: 'LO! REM ; Let anguish be... let it be love; it follows me.' Or perhaps: 'May pain be his leather strap, and may it follow a nasty barked pole.'

These are just two of the millions (all right then, 33) of entries in our Latin Larfometer Laurel competition, all delivered 28 days after publication of March ChipChat. The winner is this revealing (and futuristic) epitaph for a Spectrum: 'In loving memory of my Spectrum millions (that I lounge amid), here I go again, sweetie.' Special message to Jeff Clark of Cheshire: Please allow 28 days for delivery of your prize.

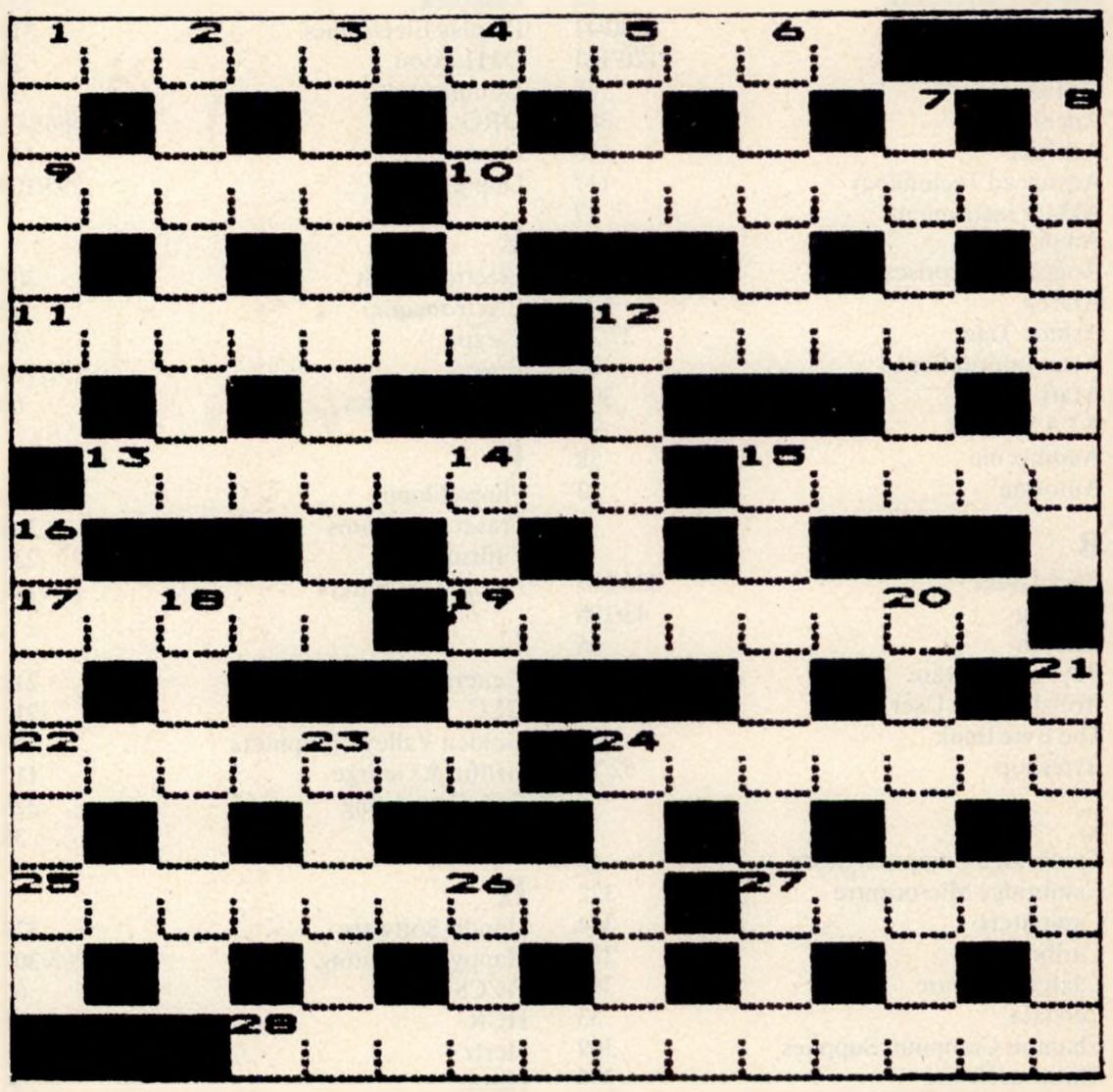
★ ★ ★

This is a QL–free page
PCW: QL?
Sinclair: Nein, Danke!

Trawlermen working deep-sea nets in Keston Ponds, Bromley hauled up two black boxes dripping with mud and slime. After a controlled explosion (the skipper had indigestion) the devices were identified as a pair of RML 480Z micros. A brisk wash and brush up and one machine worked perfectly: the other is well on the road to recovery. So *that's* what soak-testing means.

★ ★ ★

That chameleon of the computer world has changed its name again. Formerly the Elan, then Flan, it is now to be called the Enterprise. Has the name been changed before the Flan goes stale or are they merely *flan*elling? All this, coupled with the legendary Sinclair delays, has inspired us to announce the all-new ChipChat computer. We're not sure what it is, what it will be called or, for that matter, when it will be available, but it's the machine you've been waiting for. Send your cheques now.



Submit your entry to *PCW* by 19 May. You could win £10!

CLUES ACROSS

1 A1, character-wise? (12)
9 'Tuck right into a beer': popular statement with programmers! (5)
10 Anxious time for NASA, though it usually comes to nothing (9)
11 Give claim to ET and INTEL proceeds (7)
12 A marked aid in data capture for the retail trade? (3,4)
13 Waves of CB freaks? (8)
15 There may be a hitch at the end of this walk-way... (5)
17 ... and perhaps a pirate's downfall at the end of this (5)
19 Every century or so, the rescue of a file thought lost (8)
22 He tells about dead King (7)
24 Writer thanks North East Gas (7)
25 Saves up? Quite the reverse (9)
27 So long as it avoids more repeats (5)
28 Perhaps rudely infers what a good program should be (4-8)

CLUES DOWN

1 Forbidden fruits of the personal computer world? (6)
2 Game indicator useful for data handling (7)
3 Top-selling game that ruined the picnic? 3,6)
4 'Mac' of the BBC, relatively speaking? (5)
5 English-Greek character — it will never get off the ground (3)
6 Make a connection with this face (5)
7 Right boot's dilapidated — that's the likes of Marvin for you! (6)
8 Make it green as a whole (7)
12 Language the airline reprinted without correction (5)
14 It's wrong to mix the three R's with Old English (5)
15 A challenge for problem solvers. (Enter, a VDU may come of it!) (9)
16 How BBC Micros get from A to B? (7)
18 Admits 'Hangman' feature lacks gravity (6)
20 Was not passive, being a sort of a red, etc. (7)
21 Have another game of 'Othello', perhaps, after the engineer (6)
23 Demonstrates bias in playing the arcade game (5)
24 Model problem (5)
26 Appearance of some Sinclairs (3)

BLUDNERS



Two errors crept into the BBC 'Fred' listing in the March issue. In line 100, the dimensioning statement should have read '... M%(ME%)...', and in line 1270 the second colon in the line should be removed (though this doesn't affect the operation of the program).

Incidentally, if you want Fred to present its deductions as it makes them, add in a new line as follows: 2645 IF EQ=0 THEN PRINT T$(A%); " "; L$; " "; T$(2).

There's also a bug in BBC 'Omniopoly'. When a player is sent to jail from the bottom row of the board, the program crashes! Apologies to all who have fallen victim to this bug — the solution is to amend line 2400 to read: IF 2%=41 AND N%<32 AND N%>11 ST=-1 ELSE ST=1.

END

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